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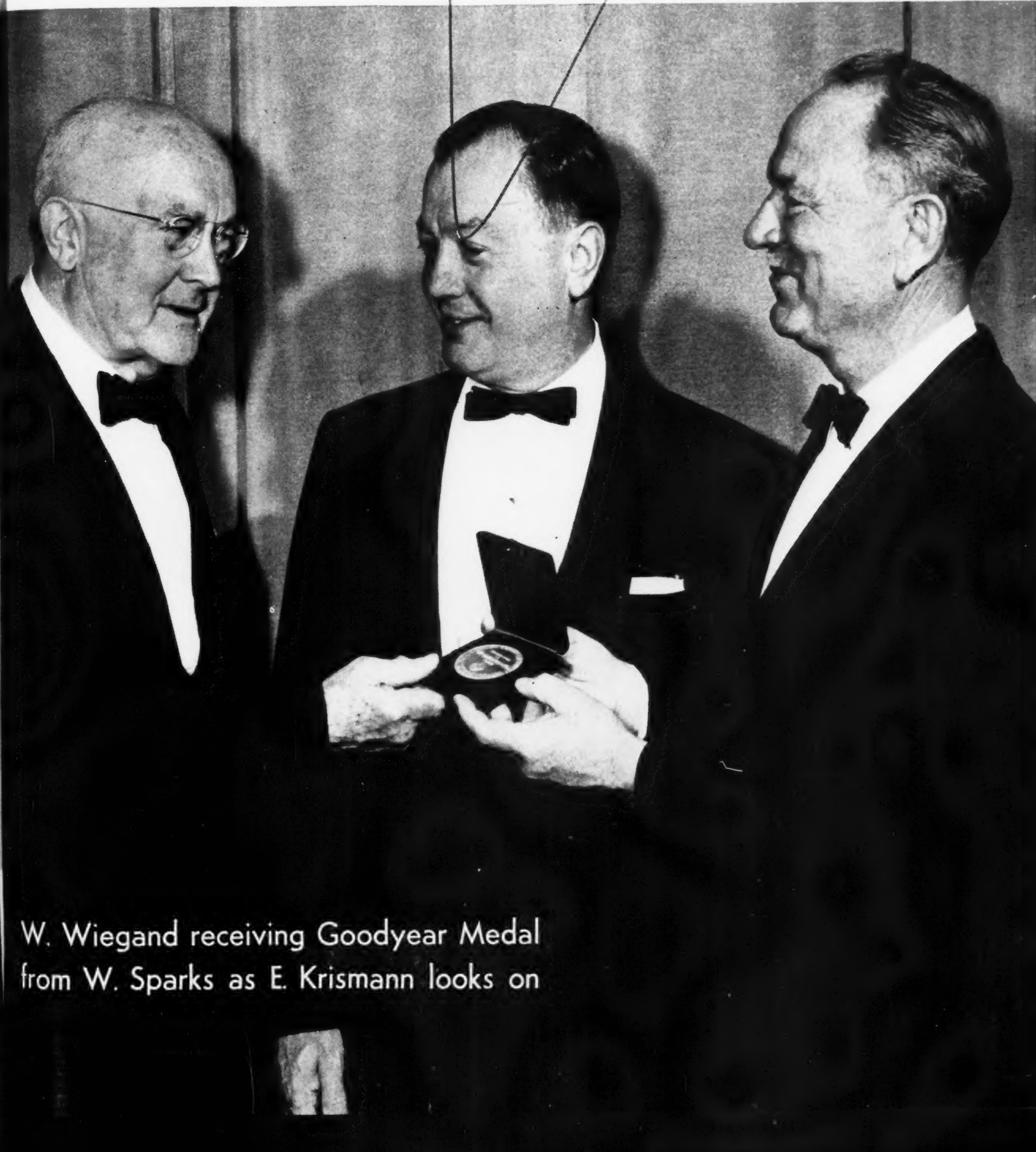

W. Wiegand receiving Goodyear Medal from W. Sparks as E. Krismann looks on

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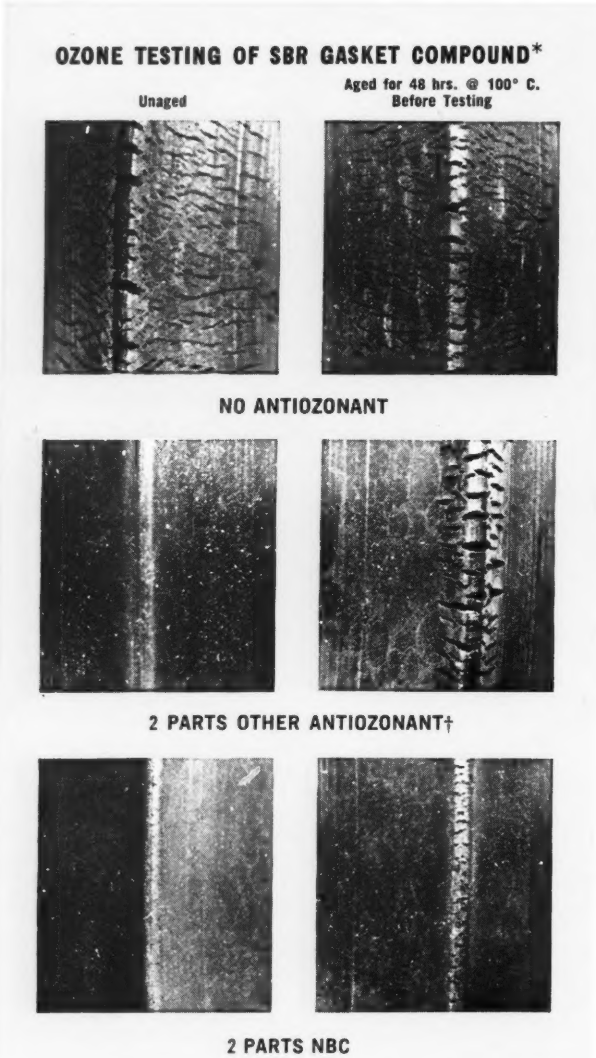
. . . a heat-resistant, non-volatile antiozonant for SBR and Nitrile Rubber



*Gaskets bent over 2" mandrel and exposed to a conc. of 0.5 ppm of ozone for 150 hours @ 100° F. Compound available on request.
†Substituted phenylenediamine

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RUBBER WORLD

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The opinions expressed by our contributors do not necessarily reflect those of our editors

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June

NEWS of the RUBBER WORLD

The stereo-specific polyisoprene and polybutadiene replacements for natural rubber continue to make news. A report by Shell that a second polyisoprene plant is planned with double capacity of the first was followed closely by an announcement by Goodyear that a plant would be put up in Texas to produce both Natsyn (polyisoprene) and Budene (polybutadiene), although no capacity was given.

Natural rubber, however, is also still very much in the news. The Rubber Association of Singapore and Malaya was formally inaugurated May 1 in Singapore. Combining many services performed by other agencies in the past, the new association will represent all sections of the Malayan rubber trade. A permanent vice chairman will handle day-to-day affairs, as is done by the London Association.

The National Highway Users Conference elected another rubber industry representative as chairman. U. S. Rubber board chairman, H. E. Humphreys, takes over following two terms by William S. Richardson, B. F. Goodrich director. Both men pleaded for sound, advance planning of highways with the cooperation of Congress and the President.

Rubber industry salesmen are driving farther this year to make sales. Auto leaser, A. J. Schoen, Wheels, Inc., predicts average mileage in 1960 will be 1,500 miles more than in 1959: 21,500 miles this year, contrasted with last year's 20,000 miles. Increased competition is given as the major reason for this higher travel figure.

The 1958 Census of Manufactures preliminary figures show the synthetic rubber industry up almost 50% over the 1954 production. Tires and tubes are up 26% in the same period in regard to value of shipments. Miscellaneous rubber products, not elsewhere classified, were shown to have increased shipments about 10%.

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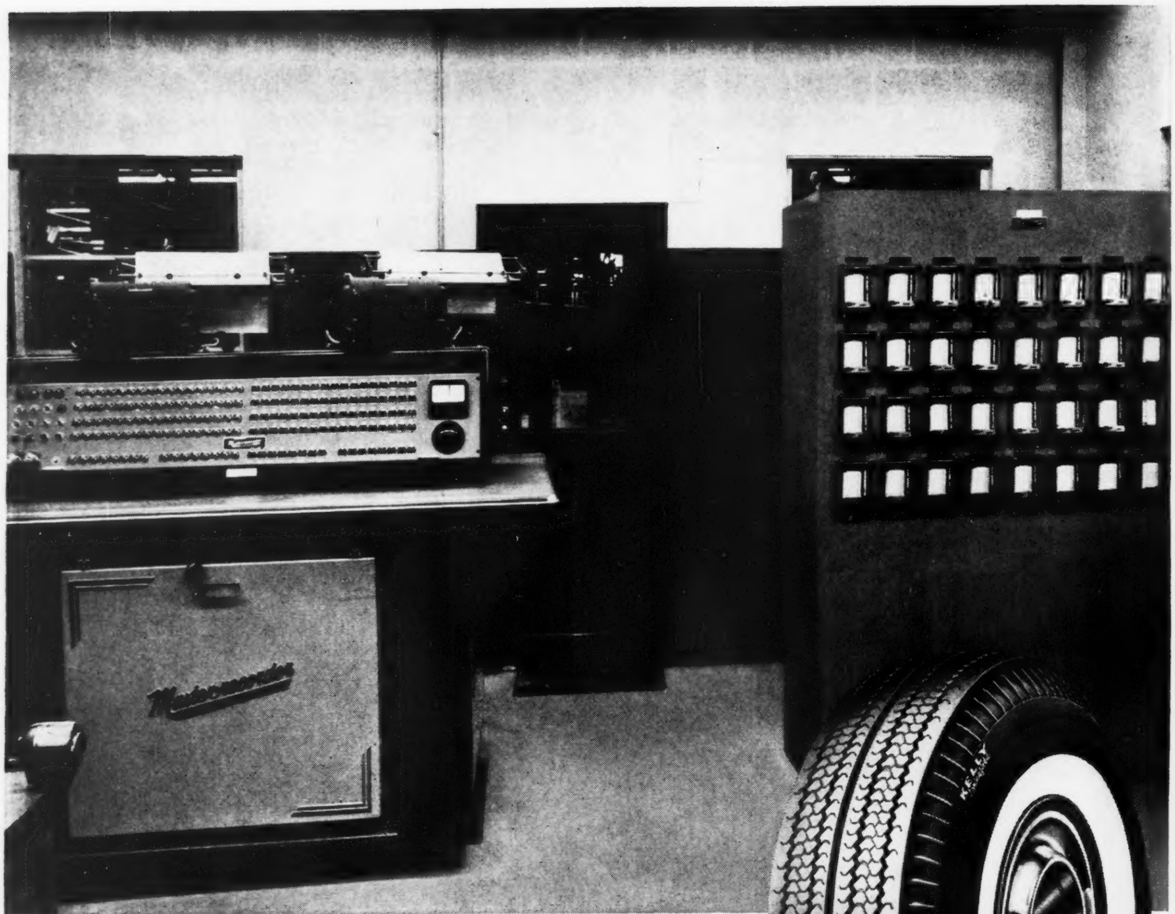


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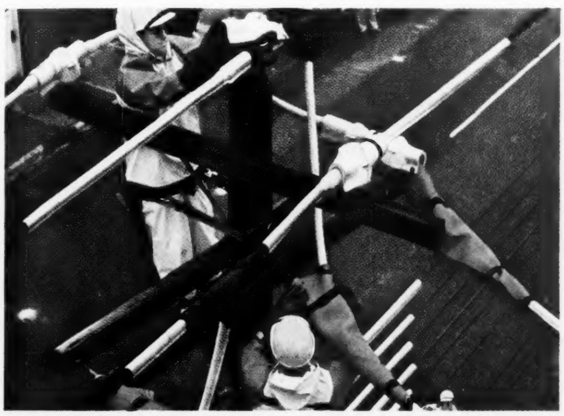

"FOUL" WEATHER FRIENDS are the linemen's suits pictured above. They're made invitingly warm and comfortable with a coating based on PLIOFLEX and carefully protected with WING-STAY T for long-term softness, flexibility and light color.

BUILT TO TAKE A BEATING is the handsome car floor cover you're looking at here. It's made of PLIOFLEX to assure clean, crisp colors and excellent durability at low cost. Its high uniformity and easy processing help make this possible.

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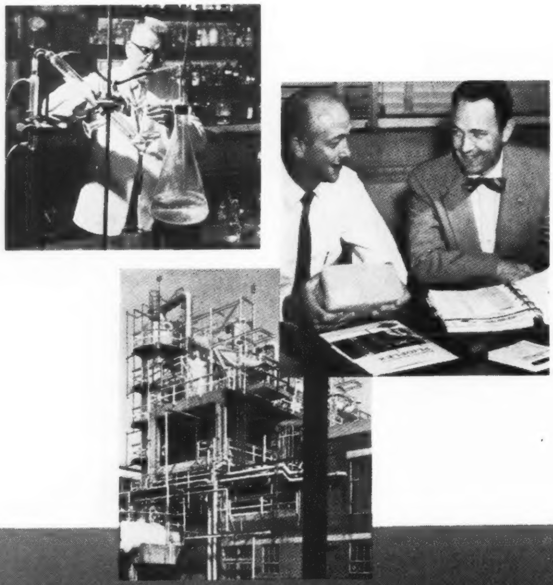
If you would like further information on any of the products of our Rubber & Rubber Chemicals Department, feel free to write to Goodyear, Chemical Division, Dept. R-9418, Akron 16, Ohio.

YEAR CHEMICAL DIVISION

GOODYEAR

where do we go from here?



No one can predict the future exactly. But one thing is certain—the market for synthetic rubber will continue to grow—and rapidly. Current estimates are for present consumption to double in the next ten years.

From our standpoint, this sort of growth will bring with it the development of many new and improved rubbers. It also will bring even higher standards of product quality and service. And it's our firm intention to keep pace with this growth and development — to maintain, or improve where possible, our current position in the field.

Toward this end, our extensive research and development facilities are continually at work on new and different polymers and compounding chemicals as well as on the improvement of current products. Similarly, our production plants are continually being modernized and expanded to keep pace with developments and demand. We think you will agree that the results of this type of program are evident in the extent and quality of our current line of products.

In still another area, our technically trained sales force and well-equipped sales-service laboratories are so organized as to render the ultimate in service and to expand as required by the market growth. Here again, we invite your appraisal.

Speaking of appraisal, may we suggest, if you are not already acquainted with our products and services, that you sample both by contacting the nearest sales office listed below:

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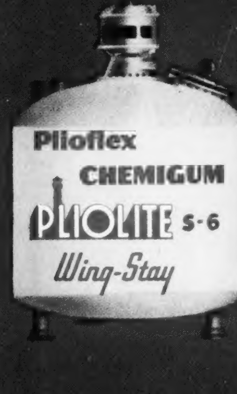


Lots of good things come from

GOODYEAR

CHEMICAL DIVISION

NEWS from ABROAD

World Production Capacity of Synthetic Rubber

World production capacity of synthetic rubber at the beginning of 1960 is put at 3,000,000 tons in a recent table[1] in which available information has been arranged by countries, economic areas, and types of product. The figures indicate that the countries of the Western World together have an estimated capacity almost four times that of the Communist countries, that is, 2,350,000 tons, against 670,000 tons. However, though further expansions in the West are in prospect, especially in the OEEC countries, Japan, and in the hitherto less industrially developed countries such as India and those of Latin America, the Communist nations aim at speedily eliminating the difference, to judge by their published plans.

The table mentions 24 sites of synthetic rubber manufacture in the United States, with total annual capacity put at 1,820,000 tons; six sites in Britain, with present capacity of 100,000 tons, to be increased to 150,000 tons; five sites in the Commonwealth countries, capable of producing 265,000 tons and eventually 400,000 tons a year. The Common Market countries account for 12 sites, with present and future capacity of, respectively, 205,000 and 470,000 tons. An output capacity of 80,000 tons is looked for by 1961 in Latin America, where Argentina, Brazil, Mexico, and Venezuela are known to have more or less well-advanced plans. Israel is to erect a factory for 15,000 tons in Haifa. Japan already has two factories with capacity of, respectively, 30,000 and 10,000 tons; while two more are in prospect, one of which is a pilot plant for polybutadiene.

According to their plans, Communist countries should have altogether 19 factories by 1970, with total output capacity of about 2,440,000 tons—rather more than the total the Western World is thought to be able to produce at present. Russia itself has factories in 12 areas, and it is gathered that the present estimated output of 500,000 tons a year is to be raised to 2,000,000 tons by 1966. Poland will get a factory at Plock for 60,000 tons, which is in addition to the Oswiescim works, the capacity of which, now 36,000 tons, is to be increased to 70,000 tons. Czechoslovakia will soon have a factory at Kralupy for 30,000 tons.

East Germany has the Schkopau works, with present, and future capacity of, respectively, 90,000 and 120,000 tons; and Rumania, the Brzesti factory for 50,000 tons, to be raised to 100,000 tons. Finally Communist China is to have two factories, each for 30,000 tons, presumably in the near future.

Most of the output throughout the world will consist of SBR. World consumption of synthetic rubber is put at rather more than 2,000,000 tons this year so that only an average of about 70% of capacity will be used.

[1] *Kautschuk u. Gummi,* Mar., 1960, p. 64.

See D-C Silicones At Osaka Trade Fair

Some 4,000 people an hour visited the Dow Corning silicone exhibit over the opening week-end of the 1960 International Trade Fair at Osaka, Japan. The fair, which opened April 9 for 18 days, was expected to draw more than 1,250,000 visitors during this time. The products of 37 companies were displayed in the U. S. exhibit.

The silicones, products of Dow Corning Corp., Midland, Mich., were included in the fair by invitation of the Office of International Trade Fairs, United States Department of Commerce. An exhibit pavillion about 130 feet in length was used in demonstrating the advantages of silicones and in illustrating the properties and applications of these semi-inorganic materials.

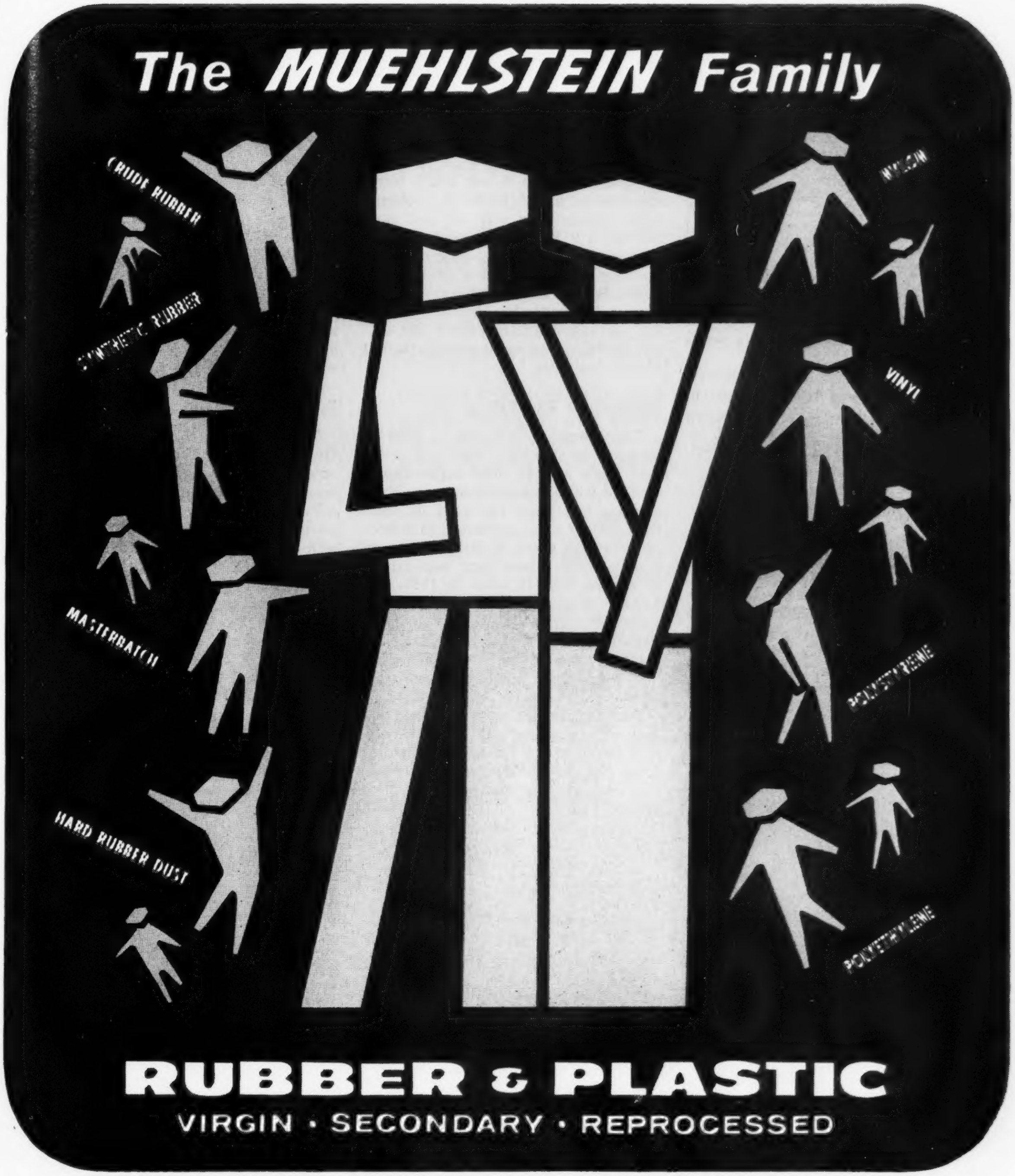
Hundreds of silicone applications were explained, including silicone rubber that vulcanizes at room temperature, silicone dielectric materials, silicone defoamers, silicone paint resins, and silicone adhesive tapes. Also displayed were artificial heart valves, a brain valve, and an electronic heart stimulator constructed with Silastic silicone rubber. Replacements for body parts lost through disease or injury were also displayed. Included in this section were ears, partial face pieces, and hands made with exacting detail from silastic, an inert, non-toxic rubber that can be used for many medical applications.

Ketjen-Carbon Black Plant Now On-Stream

Ketjen-Carbon, Ltd., reports that its 24,000-ton-per-year carbon black plant, the first in the Netherlands, went on-stream April 24 in the industrial area in Botlek near Rotterdam. The plant was built within a year; the first pile for the plant was driven in on May 12, 1959.

(Continued on page 18)

Among the dignitaries who visited the Dow-Corning exhibit at the 1960 Osaka International Trade Fair, were *(left to right)*: Robert G. Dean, Dow Corning's exhibit manager; Suteichi Sakata, Chief of Foreign Affairs, Osaka Prefecture; The Honorable Douglas MacArthur II, U. S. Ambassador to Japan; and Howard Messmore, U. S. Exhibit Manager



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(Continued from page 16)

Ketjen-Carbon, Ltd., was established by the Royal Sulfuric Acid Works Ketjen, Ltd., (Koninklijke Zwavelzuurfabrieken v/h Ketjen N.V.), Amsterdam, a Dutch producer of sulfuric acids and catalysts for the petroleum industry, participating for 60% and Godfrey L. Cabot, Inc., Boston, Mass., with a 40% interest. The production, based on Cabot know-how, has started with the following carbon black types: ISAF, HAF, FEF, GPF, SRF, with the intention of enlarging this series in the near future.

A modern, well-equipped laboratory, staffed with experts, has been built in Amsterdam, which will be in a position to supply consumers with desired information regarding the various applications of the carbon blacks.

New Rubber Association

The Rubber Association of Singapore and Malaya, whose projected formation and scope were reported in our April issue (page 8) was formally launched at the inaugural meeting held May 1 in Singapore. As earlier mentioned, the Association is to represent all sections and races in the Malayan rubber trade, and the four categories of members—estate selling agents, brokers, manufacturers' buying agents, and dealers (including packers, millers, and importers) —will have equal voting rights. The Association will eventually take over responsibility for the clearing house which at present rests with the Singapore Chamber of Commerce Rubber Association (SCCRA). Last year payments by the clearing house of f.o.b. tenders amounted to $460,200,000 (Straits), representing 1,373,448 tons of rubber.

A committee of 18 members was elected, including six members from each of the three sponsoring organizations: SCCRA, Rubber Trade Association, and the Federation of Rubber Trade Associations in the Federation of Malaya. Tan Lark Sye was elected chairman; E. G. Holiday, the well-known broker, is deputy chairman. A chartered accountant, C. W. Tresise, was appointed permanent vice chairman; he will run the day-to-day affairs of the Association. This appointment is an entirely new departure and follows the organization of the London Rubber Trade Association.

Malayan Planting And Replanting Plans

Last February the Federation Government announced a $20,000,000 (Straits) planting scheme under which smallholders owning five acres or less would be allotted an additional six or seven acres of new land for rubber, to be planted according to a system of blocks of not less than 100 acres each. In this way the smallholders would have larger and more economic units providing a steady income and a better standard of living. Under the scheme, $400 (Straits) per acre of new land planted will be granted eligible smallholders—that is, Federal citizens whose holdings do not exceed a total of five acres. So far little headway seems to have been made; the difficulty is that the plan requires 50,000 acres, and suitable land in the various states is not easily obtainable.

Smallholder Replanting

The campaign launched in 1959 to persuade smallholders who had so far held back also to start replanting is credited with the accelerated rate of replanting last year. The total of more than 74,000 acres replanted to rubber in 1959 was about 12,000 acres more than in 1958. There were applications to replant 136,341 acres in 1959, and 159,820 acres this year, against applications to replant 99,773 acres in 1958. According to the Deputy Chief Replanting Officer, Tan Teng Poey, 325,000 acres were replanted during the period 1952 to 1959.

How the replanted smallholdings fare in certain states is revealed in the report for 1959 of the State Replanting Office for Kedah, Perlis, and Penang. The total area replanted in these three states is not quite 26,000 acres. Average yields vary from 750 pounds an acre in Province Wellesley (Penang) to 790 pounds in Central Kedah; on some holdings under clonal seedlings, the average is more than 800 pounds per acre. In view of the fact that the trees are still rather young, these results are satisfactory as far as they go, but inefficiency, carelessness, and the plain desire to avoid hard work, where possible, have kept yields down in some districts, at the same time allowing that pernicious, difficult-to-eradicate weed, lallang, to persist.

Again, in group replanting an instance is noted of a certain block which shows excellent results near the main road, while farther back, the standard of cultivation is far from satisfactory. Then there is the disturbing possibility of smallholders being tempted by current high prices to tap too soon. Such a tendency was noted in a pilot survey last year among the first smallholders to replant under the government scheme.

The conditions noted in the small area covered by the report for Kedah, Perlis, and Penang can perhaps not in justice be considered typical of smallholder replanting throughout the Federation, but certainly indicate—what the report in fact stresses—that continual advice and supervision are essential for the success of the scheme.

The Rubber Research Institute does have plans to expand the field staff for its Smallholder Advisory Service to 40 rubber instructors and 300 assistant rubber instructors. At present only 21 instructors and 90 assistant instructors are available. The training for rubber instructors involves a diploma course of three years, followed by at least six months of field training and experience. Assistants require a total of six months of theoretical, practical, and field training. It will therefore be some time before the necessary personnel is ready, and in any case there is some question as to whether the number envisaged will be sufficient.

Estate Replanting

The Replanting Scheme for Estate Owners aims at replanting 423,808 acres — about one-fifth of the estate land under cultivation now—by the middle of 1962. According to a report on progress, more than 400,000 acres were replanted from 1953 to 1958, and almost $60,000,000 was paid to estate owners under the Rubber Industry (Replanting) Scheme in that period. At the same time, $1,388,410 was paid for replanting rubber land with other crops, as oil palms, coconuts, tea, coffee, etc.

By the end of 1958, 709 estates of more than 100 acres each still had not registered under the scheme. However, its benefits are becoming known also to the owners of smaller estates in the more remote areas, and more of them are gradually joining the plan.

Russia to Produce HAF Carbon Black

Production of HAF black in Russia will soon be undertaken. Meanwhile channel gas and anthracene blacks largely retain their importance for tread stocks, especially since recent efforts have led to considerable improvement in the manufacturing process at the Kadievka Carbon Black Works, resulting in the production of an anthracene black with properties said to bring it nearer to HAF.

K. A. Pechkovskaya and P. N. Orlovskii[1] report on the new anthracene blacks, comparing it with the German anthracene black CK-3, the older, 1956 type of anthracene and channel gas blacks, and HAF. The new anthracene black is slightly finer than the 1956 type and has less porous surface, lower content of oxygen and extractable substances; as compared with the older Russian blacks, it has reduced adsorption activity for curing agents and accelerators, giving vulcanizates with increased modulus and strength, and reduced breaking elongation. Hysteresis properties of vulcanizates are practically the same as with the old anthra-

(Continued on page 20)

[1] *Soviet Rubber Tech.*, Feb., 1960.

(Continued from page 18)

cene blacks. Used with oil-extended butadiene-styrene (70:30) rubber, the new anthracene black yields vulcanizates with increased abrasion resistance; crack-growth is practically unchanged.

Israeli Firm To Use Reclaimator Process

The Government of Israel has given its approval to a plan to reclaim much of the country's scrap rubber by authorizing a patent licensing and technical aid agreement between U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y., U.S.A., and Gamid Rubber Products & Plastics, Ltd., Natanya, Israel, a subsidiary of Koor Industries & Crafts Co. Ltd.—the industrial division of Solel-Boneh, Ltd., of Israel.

The American company, which developed the Reclaimator process, a continuous, completely automatic method of rubber reclaiming, will supervise the construction at Natanya of a plant with an initial daily capacity of 7,000 pounds and an ultimate expanded daily capacity of between 20,000 and 25,000 pounds. The plant is expected to enter production early in 1961.

Under the terms of the agreement, the plant's output, which will go primarily into new tire, tube, and mechanical goods production, may also be exported to countries in Eastern Europe and Africa. In order to satisfy the demand for Reclaimator rubber in advance of the plant's opening next year, Gamid Rubber Products will begin immediate distribution of all grades of U. S. Rubber Reclaiming's products—powdered, extruded slab, and standard sheet slab—to 16 countries in the Eastern European-African area.

The initial cost to Gamid Rubber Products of installing the Reclaimator and other production machines will be $300,000. Thereafter, plant capacity may be doubled or tripled by the addition of a second or third Reclaimator—plus auxiliary equipment—at a cost of $90,000 apiece.

Boric Acid Latex

In searching for alternatives to ammonia for preserving latex, the Rubber Research Institute of Malaya has originated several low ammonia latices commercially produced in Malaya, as: (1) Santobrite latex—including 0.1—0.3% sodium pentachlorphenate or pentachlorphenol, dissolved in caustic soda, besides 0.2—0.1% ammonia; (2) EDTA latex—with ethylene diamine tetracetic acid plus 0.2% ammonia; (3) combinations of (1) and (2); (4) a latex using zinc dialkyl dithiocarbamate and soap, plus 0.2% ammonia.

A report on the latest development[1] —boric acid latex—indicates this latex is prepared with 0.2—0.25% boric acid, 0.2% ammonia, and about 0.05% ammonium laurate soap; the boric acid reduces mechanical properties of low ammonia concentrate, and the ammonium laurate is added as a corrective.

Boric acid-preserved latex, we are told, is a good low ammonia latex which in many cases can be substituted for fully ammoniated latex concentrate with no modification of users' procedure; in other cases some change in formulation is necessary. This is indicated by such criticisms as: (1) Some deterioration has been noted on prolonged storage. (The cause here is believed to be bacterial growth, which can be stopped by the addition of small amounts of bactericides). (2) Chemical stability is lower, and thickening may occur on extended storage after compounding. (3) The presence of borates retards vulcanization, and foam rubber may have lower hardness. (4) Unvulcanized films have poor aging properties. (This last allegation the RRI has not been able to substantiate.)

The RRI points out that for most applications the defects are outweighed by the advantages: the step of reducing ammonia content of 0.7%-ammonia latices is eliminated; boric acid is not poisonous, has no dermatitic action, and is easier to handle than ammonia. Rubber films are lighter in color than those from other latices.

That consumers, especially in Europe, are recognizing the advantages of boric acid latex seems evident from recent statistics. In 1957—the first year of commercial production—344,178 imperial gallons were shipped; in 1958, 606,917 gallons; and in 1959, 1,555,783 gallons. The latex, now made by seven Malayan producers, went to 15 different countries, almost half going to the European continent, and 26.3% to Britain; America took 21%, and the small remainder was shipped to other countries.

[1] *Planters' Bulletin*, No. 46, Jan., 1960.

Pelletized News

DU PONT CO. (UNITED KINGDOM), LTD., reports that production of neoprene synthetic rubber for the United Kingdom and other European markets has started at its Maydown Works at Londonderry, Northern Ireland. The Maydown Works, situated on a 365-acre site, is the second manufacturing facility to be put into operation by Du Pont's European subsidiaries in the past six months. Du Pont de Nemours (Belgium), S.A., began production of paint last December at Malines, Belgium.

The new director of the Rubber Research Institute, appointed to succeed C. E. T. Mann, who resigned in January, is C. C. Webster, principal of the Imperial College for Tropical Agriculture in Trinidad. Dr. Webster, who in 1956 spent a year in Malaya as Director of Agriculture, is an expert on tung oil. He was scheduled to take up his duties in Malaya at the end of May.

SOUTH AFRICA is using neoprene, bonded to a backing layer of natural rubber, to line tanks for uranium reduction plants because the lining materials previously employed were found to deteriorate too rapidly. The tanks, eight feet high and 50 feet in diameter, serve to clear the pregnant solution from solids—mainly siliceous matter—preparatory to electrolytic reduction.

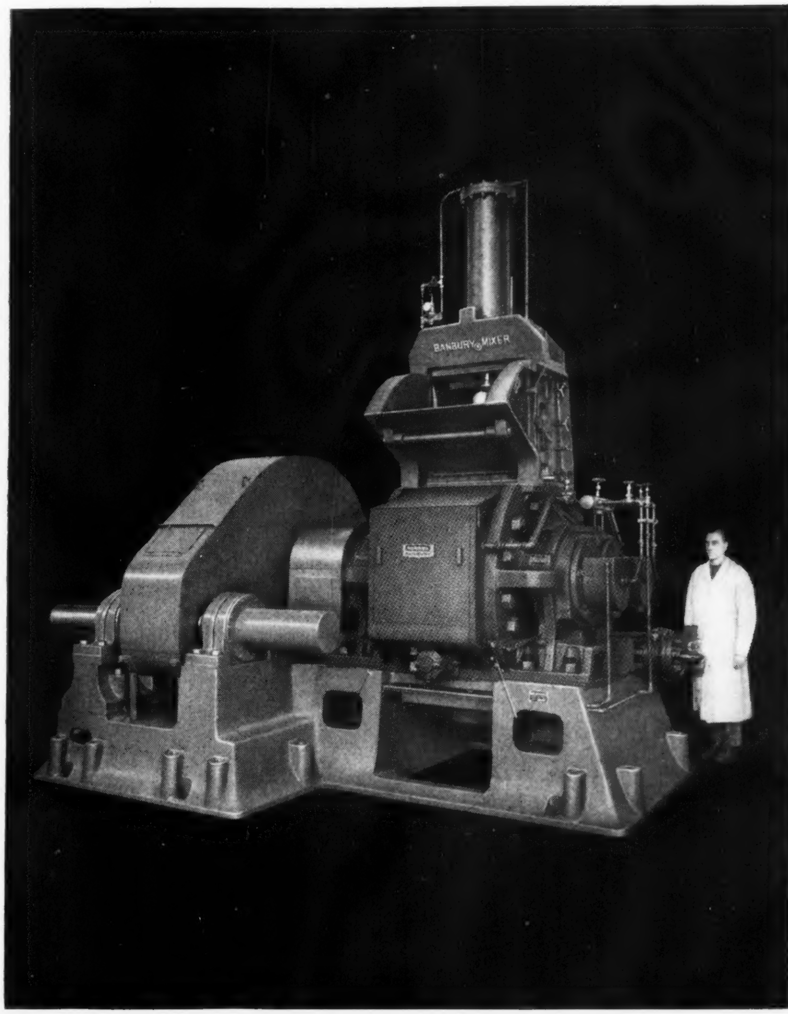
An India-Soviet agreement involving 85,000,000 rupees, provides for the erection in India of various plants to manufacture medical and surgical instruments and apparently also one for manufacturing synthetic rubber, it is reported. One gathers that a site has already been found in Hyderabad for the latter, for which the Soviet Union is expected to supply equipment by the end of 1963.

(Concluded on page 22)

This road in Birmingham, England, is red-colored rubberized asphalt dressed with red precoated chippings. It has an unusual color and long-lived elasticity. Flower box dividers add an unusual touch to Birmingham's latest six-lane answer to the world-wide problem of city traffic.

Now you can modernize your Banbury with any of these new features

- *hydraulic drop door*
- *roller bearings*
- *self-sealing dust stops*



Any combination of these new features can be yours when you order a new Banbury® mixer body from Farrel. Thus you can bring your existing Banbury up to date without going to the expense of a new machine.

The hydraulic drop-door design eliminates a source of leakage and contamination which cannot be avoided with a sliding door. It is hinged, and has an edge tapered to fit the bottom of the mixing chamber so that a good line of contact is obtained. The door is leakproof throughout a full period of normal wear and there are no "rattails" left to contaminate the next batch.

New bodies can be supplied with roller bearings. These are a particularly good idea for customers with "hot" machines. Self-sealing dust stops are also available for either rubber or plastics Banburys.

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Close-up of drop door fully opened. Hinged door swings up into chamber to close. Operation causes little or no wear at points of seal, minimizing maintenance.

(*Concluded from page 20*)

Direct purchases of rubber in Singapore were made by two members of the Russian Delegation to the ECAFE meeting in Bangkok, when they visited Singapore for the working party meeting held at the end of March. Local rubber dealers reported that both were very active in meeting traders and shippers in Singapore. They contacted Chinese and European rubber dealers and accepted an offer by one dealer of between 2,000 and 4,000 tons. The mission, it is added, had applied to visit the Federation of Malaya, but had been refused entry.

CHEMISCHE WERKE HULS, A.G., will make polybutadiene rubber as its first commercial product under the licence to produce polydiolefines which the concern recently obtained from Studiengesellschaft für Kohle m.b.H., Mülheim, Germany, it is learned. This rubber is said to be particularly suitable for heavy-duty tires. Tests have shown that mixtures of polybutadiene and natural rubber have all the advantages of natural rubber plus improved abrasion resistance; they also have excellent hysteresis properties. Compounds containing oil and carbon black are good base materials. Hüls has developed two processes of its own for polybutadiene rubber, employing catalysts developed by Prof. K. Ziegler. The first samples of the new material were scheduled to appear on the market this spring.

THE RUBBER RESEARCH INSTITUTE OF MALAYA has begun to use radioactive isotopes in research on the production of rubber, *The Straits Times* reports. Experiments are in progress to determine their effects on the stimulation of rubber trees.

The French rubber industry took a total of 195,452 tons of rubber in 1959, against 196,895 tons in 1958. Vietnam and Cambodia supplied only 44,089 tons, a considerable drop from the 67,165 tons in the preceding year. The difference was almost completely made up by increased purchases from other sources, including, besides 62,979 tons of natural rubber from Malaya (against 58,211 tons in 1958) a large proportion of synthetic rubber. Locally produced synthetic rubber went on the market in May, 1959, and by the end of the year French manufacturers had bought 6,022 tons, mostly butyl, of the domestic product. The United States and Canada sent 58,871 tons of synthetic rubber, against 55,749 tons; while a substantial proportion of the 20,899 tons of rubber (against 13,070 tons) from unspecified sources, also consisted of synthetic rubber, so that total purchases of synthetic rubber by the French industry in 1959 probably reached close to 70,000 tons.

Titanium white is to be produced in the Netherlands by a company to be jointly formed by the Albatross Zwavelzuur en Chemische Fabrieken (Sulfuric Acid and Chemical Factories) N.V., and the Biliton Mij. The first-named company is affiliated with the Albatross Superphosphate Factories, of the Royal Netherlands Salt Industry group and the Cyprus Mines Corp. It is planned to set up a factory at an estimated cost of 30,000,000 guilders, in the Botlek area, which is to have annual capacity of 10,000 tons of titanium dioxide. The undertaking will be financed by the Royal Netherlands Salt Industry and Biliton Mij; know-how is to be provided by the Glidden International, an affiliate of the Glidden Co., Cleveland, O., U.S.A.; Albatross Zwavelzuur will supply the necessary sulfuric acid; while the ilmenite is to be imported from overseas. The factory is expected to begin operating early in 1962.

HOUDRY PROCESS CORP., Philadelphia, Pa., U.S.A., reports that a 25,000-ton-per-year Houdry dehydrogenation process unit to produce butadiene has gone on stream at the Japan Synthetic Rubber Co., Ltd., Yokkaichi, Japan. The new unit is part of an integrated synthetic rubber plant at Yokkaichi. The plant's capacity will be 45,000 metric tons per year of SBR rubber.

West German synthetic rubber production will be increased in the near future when a fourth production line will be put on stream at the Bunawerke Huls G.m.b.H. plant. New capacity of the facility will be 120,000 tons per year. In addition to increasing capacity, the new line will permit new polymers or grades to be offered along with the present six grades. A light-colored polymer and one specifically suggested for conveyor belt use are two of the new grades which are being developed. Oil-extended grades have been furnished for some time so that with the introduction of black masterbatch in the fourth quarter of this year, at the rate of 200-300 tons a month, Bunawerke Huls, largest producer of synthetic rubber in Europe, will be carrying all cold rubber types.

THE RUBBER RESEARCH INSTITUTE has sent three officials to India to advise the Indian Government on methods of efficient rubber production. A. Newsam, head of the Pathological Division, C. W. Brookson, head of the Botanical Division, and G. A. Watson, of the Soils Division, are to spend three weeks in South India visiting the chief rubber areas. Their services were offered to India by the Federation Government under the Technical Cooperation Scheme of the Colombo Plan.

The Russians are producing synthetic rubber directly from natural gas in the synthetic rubber works at Samgait, in the Azerbaijan Republic of the Soviet Union. This is the first time this process has been used in the USSR, or in Europe. The works, newly built under the seven-year plan, includes 17 departments and power installations and produces four types of synthetic rubber, to which butyl rubber is to be added before the end of 1962. It is expected that the natural gas rubber will be the cheapest in Russia; that production of synthetic rubber will be doubled, and that exports will start this year.

INDUSTRIAL DEVELOPMENT CORP. OF SOUTH AFRICA is investigating the possibility of producing synthetic rubber in South Africa. The area currently imports rubber at an annual rate of more than £6,000,000. If the present study indicates that the economic aspects of the venture are favorable, an operating company will be set up to engineer and operate the plant.

With two exceptions, the most important branches of the Mexican rubber industry showed substantially higher output figures for 1958, as compared with those for 1957. Automobile and truck tires increased 17%, from 930,000 to 1,088,100 units; inner tubes for these tires were up 11.1%, from 615,500 to 683,500 units; bicycle tires were almost 50% higher, rising from 427,700 to 627,100 units. The biggest increase, almost 100%, was achieved in output of soles and heels, from 21,366,000 pairs to 41,413,000 pairs. On the other hand, high inventories for 1957 led to a drop of 26.6% in bicycle tube production; while the inroads of plastics cut output of hose and tubing by 20.4%.

INDOCHINA RUBBER PLANTERS' ASSOCIATION has compiled figures showing that the principal estates in this territory produced 99,766 tons of rubber in 1959, compared with 95,958 tons the year before. Of these amounts, Vietnam's share was 65,612 tons, against 62,663 tons; while that of Cambodia came to 34,154 tons, against 33,295 tons.

Total rubber exports from Thailand came to 170,265 tons in 1959, compared with 137,415 tons in 1958. In its report, dated March 17, 1960, United Baltic Corp., Ltd., adds that it estimates 1959 shipments exceeded production for the year by about 5,000 tons, as it had been reported that a considerable quantity of rubber, held back in December, 1958, in expectation of a reduction in the export duty, had not been shipped until 1959.

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Easy, accurate extrusions make Philprene rubber the choice of leading manufacturers of electrical conductors. The photograph shows power and control cable insulated with Philprene rubber, manufactured at the Bristol Works, Kaiser Aluminum and Chemical Corporation.

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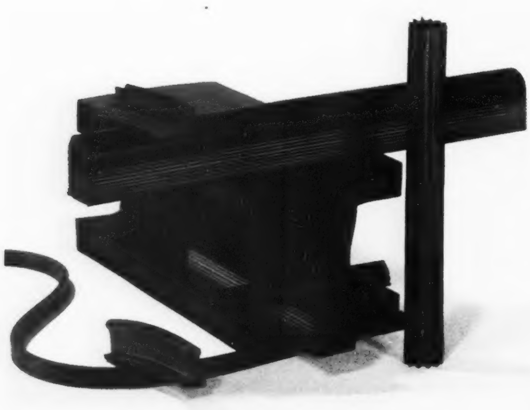

Extruded products made with Philprene polymers are accurate in size and shape. You get smooth, easy extrusions. Philprene's dependable uniformity and trouble-free processability speed up your entire operation.

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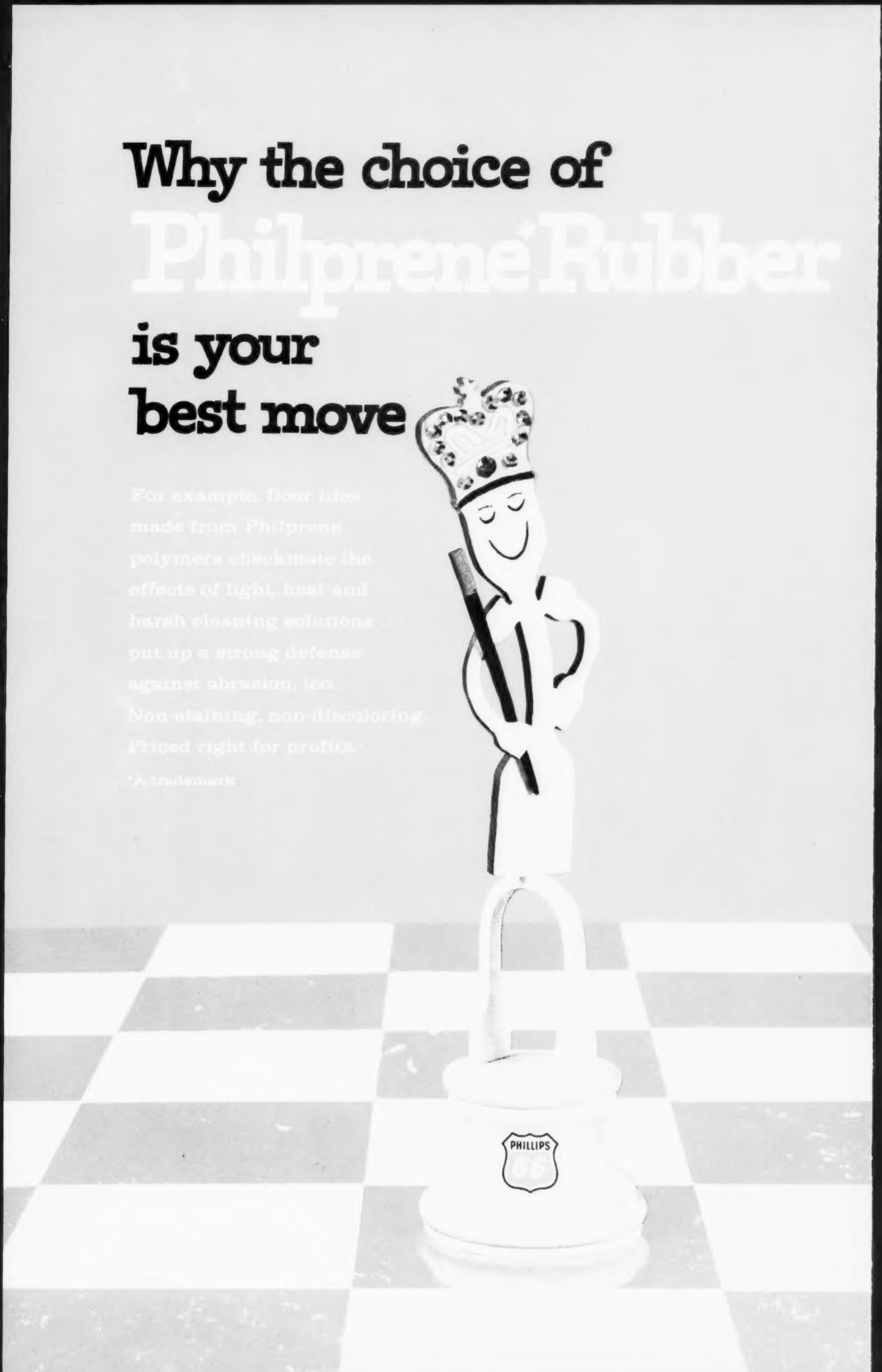
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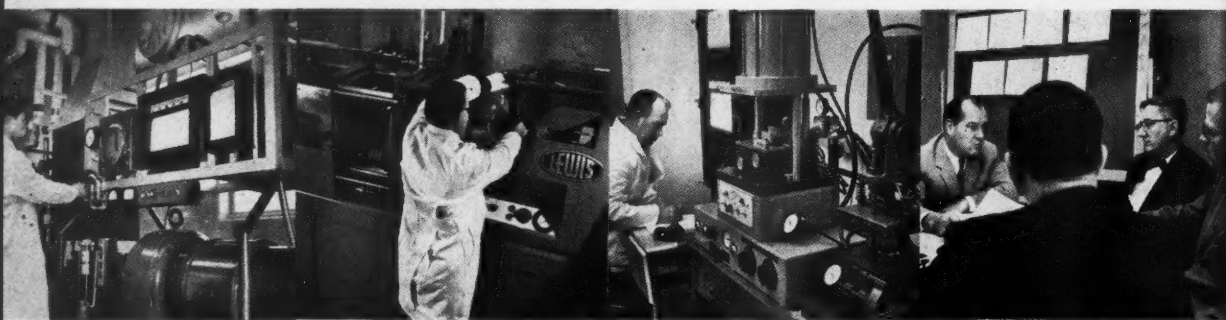
A TOUR OF UNITED CARBON'S NEW SERVICE LABORATORY



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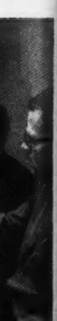

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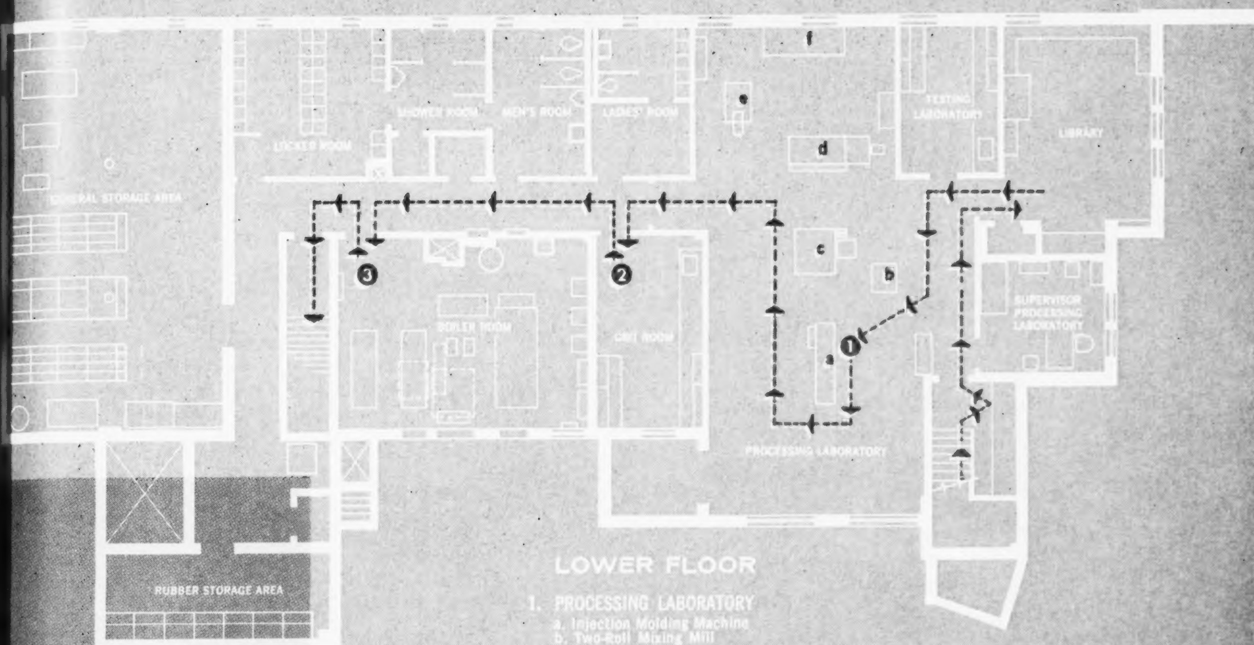

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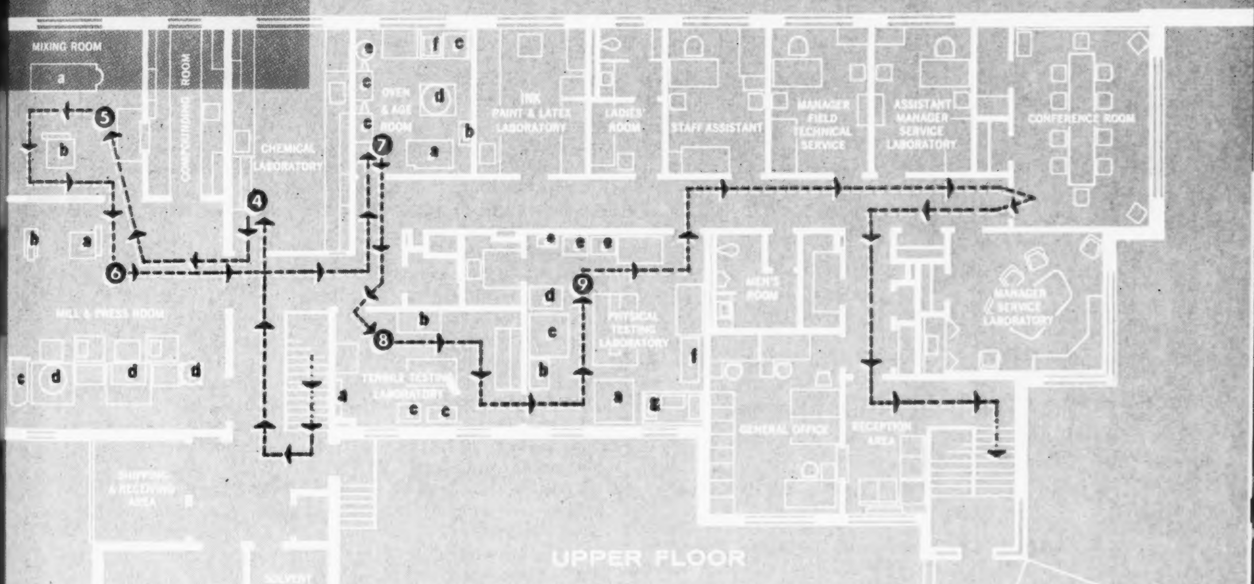
   c. Weather-O-Meter
   d. Four-Roll Inverted L Calender
   e. Extruder
   f. Albertoni Tensile Testing Machine
2. GRIT ROOM
3. BOILER ROOM



UPPER FLOOR

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   a. Instrumented Banbury
   b. Two-Roll Mixing Mill
6. MILL & PRESS ROOM
   a. Two-Roll Mixing Mill
   b. Extruder
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   d. Fade-O-Meter
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   d. Extrusion Plastometer
   e. Mooney Shearing Disc Viscometer
   f. De Mattia Flexing Machine
   g. Ross Flexing Machine

NEW MATERIALS

Poly-Phen L-118 Phenolic Resin

Poly-Phen L-118, a new phenol formaldehyde resin designed for modifying the properties of polyvinyl acetate, has been announced by National Polychemicals, Inc., Wilmington, Mass. The resin, highly reactive and water-soluble, is said to improve the resistance of polyvinyl acetate to high temperature, water, and a variety of solvents. This material, it is further claimed, also reinforces the physical characteristics of the polymer and reduces the polymer's cold-flow properties.

Poly-Phen L-118 is believed to cross-link with polyvinyl acetate and to some extent impart thermosetting characteristics to the polymer. Compatible to a high degree with polyvinyl acetate emulsions, the new resin is recommended in the range of 2-20% (based on the solids content), depending on the intended application and the required properties.

Preliminary results indicate that L-118 shows promise of being able to modify a wide variety of other water-dispersed polymeric systems such as acrylic emulsions and rubber latices.

A technical bulletin, NPL-110C, and samples of the new resin are available from the company.

Five New Synpol SBR's Available

Five new Synpol rubbers including an oil-extended polymer, two oil-extended black masterbatches, and two non-extended polymers have been announced by Texas-U. S. Chemical Co., New York, N. Y.

Synpol 8208A is an oil-extended polymer containing 50 parts of a naphthenic oil per 100 parts of polymer, stabilized with 1.25 parts of a non-staining, non-discoloring stabilizer. It is designed to give high resistance to discoloration and staining with maximum economy. The polymer was developed for use in products such as auto mats, floor tile, shoe soling, and light-colored extruded goods.

Synpol 8255B is similar to 8255A except that it is designed to have a higher compound Mooney. It is a black, oil-extended masterbatch containing 75 parts of HAF black and 50 parts of a highly aromatic type-oil per 100 parts of 1712-type polymer. Synpol 8255B is said to offer a combination of maximum economy in compound design, improved dispersion, and ease of processing. Typical applications for 8255B include such products as tire treads, camelback, and mechanical goods.

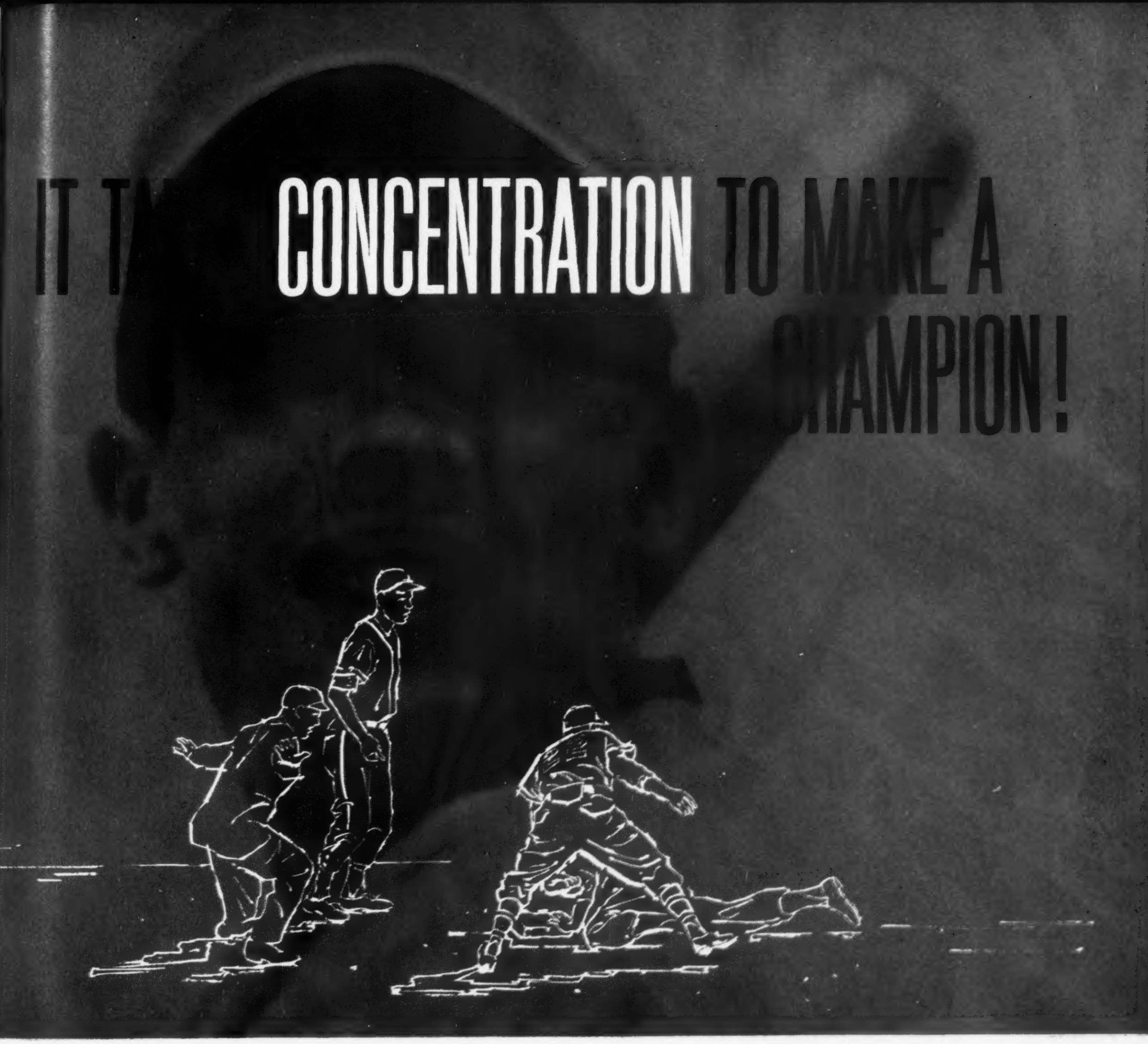
Synpol 8267A is similar to 8266, but has 60 parts of ISAF black instead of 75 parts. It is a black oil-extended masterbatch containing 60 parts of ISAF and 37.5 parts of highly aromatic type-oil per 100 parts of polymer. Typical applications of 8267A include such products as tire treads, camelback, and mechanicals.

Synpol 8103A is a new, cold non-extended SBR rubber similar in composition to Synpol 1502, but produced to a lower raw polymer Mooney plasticity. It is designed to have higher modulii and a faster cure rate than 8102A. It contains a non-staining stabilizer and a mixed fatty acid/rosin acid soap. It is coagulated by the salt-acid method.

Synpol 8101A is a cold non-extended SBR polymer which contains a fatty acid emulsifier. Glue-acid coagulation is employed to insure low ash content and low water absorption. This new polymer is stabilized with 1.25 parts of a non-staining, non-discoloring stabilizer. It is designed for use in the wire and cable industry as a low-cost primary insulation.

A description and typical physical and chemical properties of these five new Synpol rubbers follow.

(Continued on page 34)



CONCENTRATION on synthetic rubber is the key to ASRC's scoring with a wide range of low Mooney polymers—including ASRC #3110 with the lowest Mooney in the market. And a low Mooney means less money in production costs for you. It's the ease of processing, through greatly reduced breakdown time, that gives you substantial savings in power and labor.

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ASRC
THE FIRST NAME IN SYNTHETIC RUBBER

New Materials

(*Continued from page 30*)

DESCRIPTION[1]

	8208A	8255B	8267A	8103A	8101A
Stabilizer	NST,ND	ST	ST	NST	NST,ND
Emulsifier	FA	RA/FA	RA	FA/RA	FA
Coagulant	GA	Acid	Acid	SA	GA
Polymer	—	1712	1711	—	—
Oil	50-NAPH	50-AR	37.5-AR	—	—
Carbon black	—	75-HAF	60-ISAF	—	—

TYPICAL CHEMICAL AND PHYSICAL PROPERTIES

	8208A	8255B	8267A	8103A	8101A
Volatile matter, % wt.	0.10	0.21	0.37	0.75	0.16
Ash, % wt.	0.08	0.13	0.13	1.50	0.06
Organic acid, % wt.	4.68	3.50	3.67	4.75-7.0	6.66
Soap, % wt.	0.03	0.08	0.08	0.50	0.01
Bound styrene, % wt.	23.5	—	—	23.5	23.4
Carbon black, % wt.	—	33.4	30.4	—	—
Raw viscosity, ML-4 @ 212° F.	51	—	—	30-40	44
Compound viscosity, ML-4 @ 212° F.	49	54	51	65	53.5
Tensile, psi. (50′ cure @ 292° F.)	2450	2900	3100	3350	4050
Elongation, % (50′ cure @ 292° F.)	550	620	750	750	720
Modulus at 300% elongation					
25′ cure @ 292° F.	550	625	375	470	540
50′ cure @ 292° F.	850	1200	725	880	930
100′ cure @ 292° F.	1100	1650	1150	1320	1360

Technical data sheets giving more detailed information and test recipes on these new Synpol rubbers are available from the company.

[1] Note: Abbreviations and symbols are defined as follows:
AR=aromatic
FA=fatty acid soap
GA=glue/acid
ND=non-discoloring
NST=non-staining
NAPH=naphthenic
ST=staining
RA=rosin acid
HAF=high abrasion furnace
ISAF=intermediate super abrasion furnace
SA=salt acid

Empol 1014, 1024 Dimer Acids

Commercial availability of two new grades of dimer acid has been announced by Emery Industries, Inc., Cincinnati, O. The grades are Empol 1024 and Empol 1014.

Empol 1024, designated Emery 3065-S during its development, was developed to meet the need of a dimer acid with an extremely low monobasic acid content for urethane foams. Its 1% maximum monobasic acid content makes it suitable for all such polymeric end-products, in which as much as 5% monobasic acids may interfere with desired properties, reports Emery.

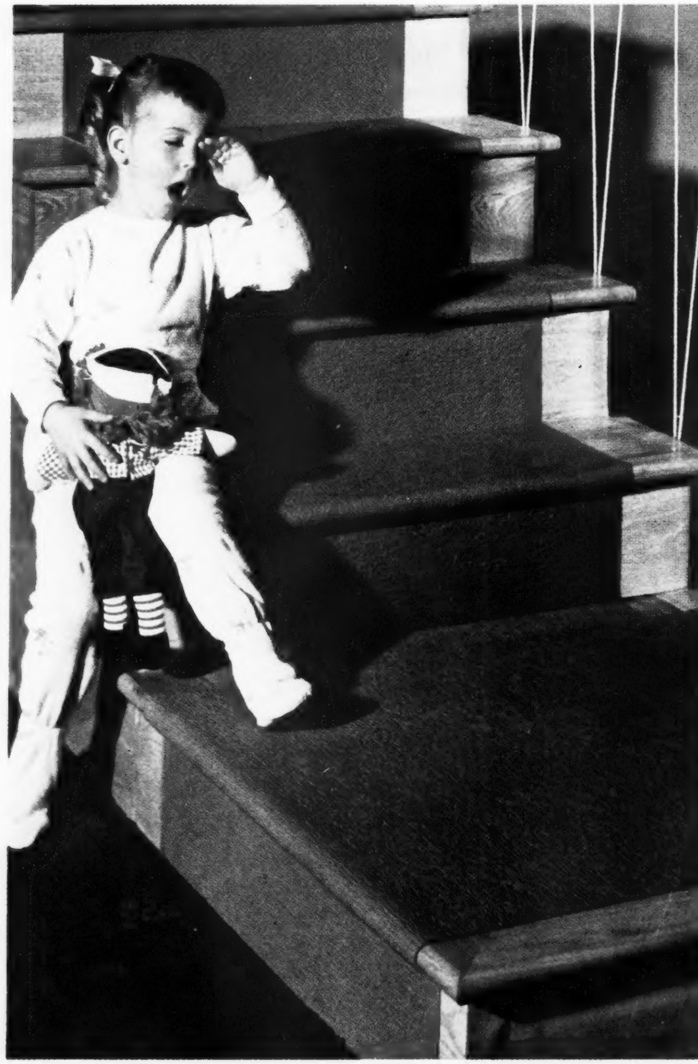
Empol 1014, which supersedes Emery development products 3019-S and 3079-S, is a 95% dimer acid also containing less than 1% monobasic acid. It is said to be the first pure dimer acid offered commercially. It extends the use of dimer acid to all applications which could not tolerate the high proportion of trimer acid present in Empol 1022 and 1024. Long dimer polymer chains can now be formed with little cross-linking.

Empol 1014 and 1024 are actually mixtures of dimer acid, a C36, long-chain aliphatic dibasic acid produced by the polymerization of two unsaturated fatty acid molecules at mid-molecule, and trimer acid, a C54 tribasic acid similarly produced from three fatty acid molecules.

Present markets for dimer acid include surface coatings, urethane foams, polyamide and polyester resins, waterproofing agents, among others. Additional information is available from the manufacturer.

How Ameripol Rubber

Non-staining — a prime requirement for erasers is to do the job quickly and cleanly. An Ameripol polymer noted for its clarity and uniformity was selected by this leading pencil manufacturer. The polymer is non-staining, won't leave marks on paper. And its properties permit easy processing in pastel colors — just right for erasers and other light colored products. *(photo below)*



Hold the cost line — The manufacturer of this rubber carpeting maintains high product quality, holds cost in line. He uses Ameripol 4700, a 50-part oil-extended rubber that cuts material costs nearly 10%, and reduces the amount of whitener needed in compounding. There may be similar cost savings possible to you by switching to a less expensive oil-extended SBR for molded and extruded goods.

Color stability — Ameripol 1502 is a uniform light colored rubber that requires only minimum pigment addition — thus making it easier to produce the bright yellow color required for airline ground crews. The rainwear has excellent color stability, and high resistance to staining and abrasion. *(photo at left)*

Ameripol
THE PREFERRED RUBBER

meets individual requirements

Luxury look—This rubber floor tile is produced with Ameripol 1502 in striking color and beauty—color that won't stain or fade in the sunlight. Since the polymer is consistently light and uniform, the manufacturer easily duplicates colors from one production run to the next. With Ameripol, the luxury look is achieved in a modestly priced product.

Flexing strength—This shoe is specially designed for sailors on wet and slippery decks. Its sole gives it perimeter traction action that grips tightly when the weight is shifted. An Ameripol polymer proved to have the excellent physical properties required; keeps its shape and strength through repeated flexing. The polymer is uniform and stable in processing.

Goodrich-Gulf Chemicals, Inc.

1717 East Ninth Street, Cleveland 14, Ohio

Ameripol
Ameripol
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Ameripol

NEW PRODUCTS

New Ray-Man "Coalmover" Belt

A new coal-belt construction whose edges are said not to fray or fan out under tough abrasive conditions is offered by Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. Called "Coalmover," the quiet-running belt is reported to last longer and to provide a higher coefficient of friction than plastic covered belts.

The exceptional pulley grip of the belt permits operation at lower tension without slip; while the low stretch characteristics of this belt insure a minimum of take up adjustments.

Other advantages claimed for this new construction are superior holding ability with all underground types of fasteners, fire resistance throughout, maximum rip and impact resistance, exceptional flexibility and easy training at all temperatures.

Like all Manhattan underground conveyor belts, the "Coalmover" is mildew-proof, moisture resistant, and certified with a Fire-Resistant Bureau of Mines acceptance designation.

New R/M Flexon Hose

A special hose, designated Flexon, which is said to withstand all known chemicals except fluorine gas, chlorine trifluoride, and molten alkali metals, also is being made by Manhattan. The tube of the hose is made from Du Pont's Teflon, which facilitates cleaning and sterilization. The hose has very low permeability, zero water absorption, good flexibility, and is easy to handle, according to the manufacturer.

The hose construction features a unique bonding of the Teflon tube to the hose body, which is said to eliminate separation, cracking, or splitting—even with small bending radii. Plies of high-tensile cotton cords of special braided steel wire, (depending on pressure or temperature) form the strength members, securely bonded to the tube and heavy-duty cover.

Flexon hose is especially suited for hot paint and lacquer spraying processes, for flexible connections in process equipment handling corrosives, caking slurries or solvents, and for conveying fluids requiring sterilization and easy cleaning. Temperatures to 325° F. and working pressures to 1500 psi. are acceptable, depending on size and type of hose.

The new hose is available regularly in diameters to 1¼ inches in 15- to 50-foot lengths, with brass or stainless-steel fittings. Larger sizes can be supplied on special order.

Additional information is available from the company.

New Dunlop Standby Tubeless Tire

A new type of lightweight, compact spare-tire assembly, called the Dunlop Standby tire, has been developed by Dunlop Tire & Rubber Corp., Buffalo, N. Y. The unit consists of a steel disk, drilled to match the wheel studs of the car, carrying a narrow-section tubeless tire. The tire is not inflated until required, at which time a CO_2 bottle or conventional inflating equipment can be used.

The entire unit is less than one inch thick, occupying less space and being lighter in weight than the conventional spare. Designed to enable the motorist to reach a point where the damaged tire can be repaired or replaced, the Dunlop Standby tire can, if necessary, be run for a considerable distance with only a slight difference in the car's performance. Cornering and braking efficiency are said to be satisfactory for the intended purpose. Comfort and shock absorption qualities are

(Continued on page 46)

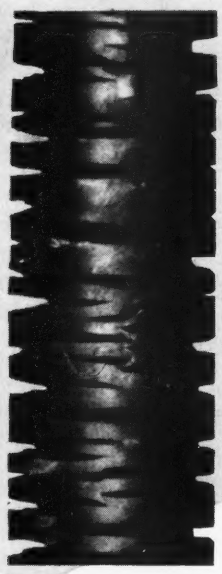
how to vastly increase the useful life of rubber...

Effect of Curing System on Antiozonant Retention in SBR Stocks after Vulcanization

(All contain 3.0 phr UOP 88; 40.0 phr HAF black)

Compound	Accelerator	Sulfur, phr	% Extractable Antiozonant
1082....	2.0 phr benzothiazyl disulfide	2.0	66.4
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1087....	None	2.0	100.0
1088....	1.0 phr benzothiazyl disulfide	3.0	74.6
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1089....	1.0 phr benzothiazyl disulfide	1.0	88.6
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1084....	1.0 phr N-cyclohexyl-2-benzothiazole sulfenamide	—	—
1093....	1.0 phr diphenylguanidine	2.0	18.0
1085....	2.0 phr tetramethylthiuram disulfide	—	35.0
1090....	4.0 phr tetramethylthiuram disulfide	—	12.9

The SBR specimens below were exposed to ozone at 100°F with 20 percent elongation for 52 hr. at 33 pphm ozone, then 187 hr. at 63 pphm ozone.



Carbon black—HAF (high abrasion furnace), Curing system—4 phr tetramethylthiuram disulfide; Hours to first crack—7 to 23.

Carbon black—HAF (high abrasion furnace), Curing system—2 phr sulfur, 1 phr N-cyclohexyl-2-benzothiazole sulfenamide. No cracks in 239 hr.

New Products

(Continued from page 42)

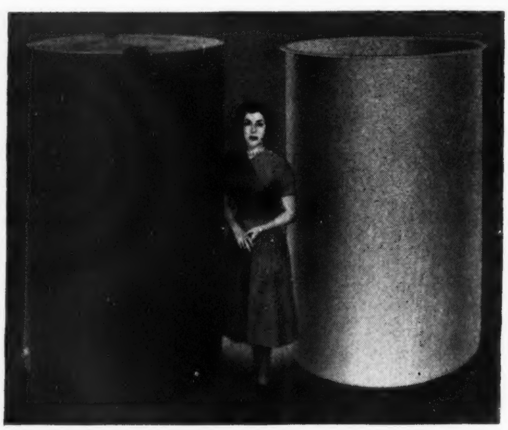
(*Left to right*) Dunlop Standby tire inflated, ready for mounting; Dunlop conventional tire inflated; Dunlop Standby tire deflated for storage

good, and tread life has been found to be substantially more than the design objective of 300 to 400 miles, reports Dunlop.

In its uninflated state the Dunlop Standby tire resembles a flat tray. Inflated, the tire becomes nearly circular in section and assumes the general appearance of a conventional tire and wheel.

The unit is bolted to the wheel hub exactly as is the normal wheel and tire which it replaces. No special tools are required. Valve fittings are standard. The automatic inflator supplied with the unit makes the motorist completely independent of other equipment.

When the original tire and wheel are replaced, the Standby tire is deflated and replaced in the car for future emergencies.



These corrosion-resistant molded polyethylene storage tanks are available in the 500-gallon capacity range from Delaware Barrel & Drum Co., Wilmington, Del. They are supplied in several styles—full open head, closed head with openings, flat or conical bottoms—in natural polyethylene or black for outdoor storage. Access and drain fittings are available in wide choice.

PRODUCTS

Can Grow Old Gracefully too

HARCHEM SEBACATE PLASTICIZERS WILL GIVE YOURS THIS UNIQUE QUALITY

Extend the life and the original looks of your products and you build customer good will that reflects itself in greater sales and profits. Nothing will give them more stability, more protection against the inroads of age than Harchem Sebacate Plasticizers. Whether you seek resistance to heat, cold, water, weather or physical abuse, the key to your problem can be found in the chart of four Sebacic Acid Esters found below.

Plasticizer	Specific Gravity 25°/25°C ±.003	Viscosity 25°C, cps	Compatible With	Outstanding Characteristics
Dibenzyl Sebacate	1.055	21-22	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers	Excellent Solvation, Very Low Volatility, Permanence, Good Electricals, Low Temp. Flexibility
Dibutyl Sebacate	0.935	7.9	Vinyl Resins, Cellulose Acetobutyrate, Synthetic Rubbers, Rubber Hydrochloride, Polymethyl Methacrylate	Low Temp. Flexibility, Excellent Aging Qualities, Non-Toxic
Dimethyl Sebacate	0.986*	3.54 @30°C	Vinyl Resins, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate, Acrylic Resins	High Solvency and Efficiency, Wide Compatibility, Concentrated Source of Sebacyl Radical
Dioctyl Sebacate	0.913	17.4	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate	Excellent Low Temp. Flexibility, Low Volatility, Excellent Soapy Water Resistance, Good Electricals

*30°/20°C

Columbian Carbon Company, Distributor To The Rubber Industry

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WRITE FOR BULLETIN OR CONSULT CHEMICAL MATERIALS CATALOG PAGES 173-175

HOFFMAN VACUUM SYSTEMS HELP CABOT CARBON KEEP DUST IN BOUNDS AT A PLANT IN CITY LIMITS

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- 100 parts polymer (COPO 1500 type)
- 52 parts HAF black
- 10 parts highly aromatic processing oil
- 1.25 parts staining stabilizer

3751—
- 100 parts base polymer (COPO 1712 type)
- 75 parts HAF black
- 37.5 parts highly aromatic extending oil
- 1.25 parts staining stabilizer

3752—
- 100 parts polymer (COPO 1500 type)
- 52 parts ISAF black
- 12.5 parts highly aromatic processing oil
- 1.25 parts staining stabilizer

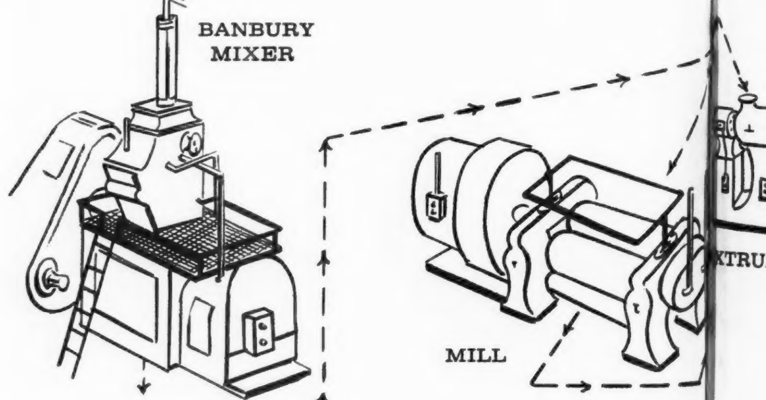
3753—
- 100 parts base polymer (COPO 1712 type)
- 60 parts ISAF black
- 37.5 parts highly aromatic extending oil
- 1.25 parts staining stabilizer

3757—
- 100 parts base polymer (COPO 1712 type)
- 75 parts HAF black
- 37.5 parts highly aromatic extending oil
- 12.5 parts highly aromatic processing oil
- 1.25 parts staining stabilizer

3758—
- 100 parts base polymer (COPO 1712 type)
- 75 parts ISAF black
- 37.5 parts highly aromatic extending oil
- 12.5 parts highly aromatic processing oil
- 1.25 parts staining stabilizer

3762—
- 100 parts polymer (COPO 1500 type)
- 40 parts SAF black
- 5 parts highly aromatic processing oil
- 1.25 parts staining stabilizer

3763
- 100 parts base polymer (COPO 1712 type)
- 55 parts SAF black
- 37.5 parts highly aromatic extending oil
- 7.5 parts highly aromatic processing oil
- 1.25 parts staining stabilizer



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TECHNICAL BOOKS

BOOK REVIEWS

"The Rubber Manufacturing Industry." Compiled by A. T. Mathyoo. Association of Rubber Manufacturers in India, 57-B, Free School St., Calcutta 16, India. Hard bound, 8½ by 5¾ inches. 194 pages.

This book contributes to the application of science and technology to industry by imparting to the junior rubber technicians of the hundreds of rubber factories in India some fundamental technical information on the raw materials and their use in compounding. The book also gives a rapid survey of the processes involved in the manufacture of a number of selected rubber goods. The statistical data and other information on the Indian rubber manufacturing industry contained in this book should prove of considerable value to many others connected with or interested in this industry.

The book describes the origin and development of the rubber industry in India. It lists the names of manufacturing plants and their products and the membership of the Association of the Rubber Manufacturers in India. The chapters on technology are illustrated, including a chapter dealing with testing and testing equipment.

"ASTM Standards on Plastics (with Related Information)." Eleventh Edition (1960). American Society for Testing Materials, Philadelphia, Pa. Hard bound, 9 by 6 inches, 1242 pages. Price, $9.00; to members, $7.20.

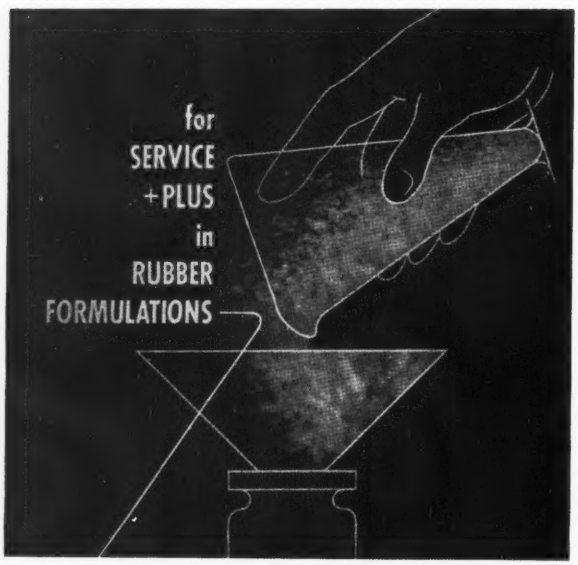
The increase in size of this new edition of the Compilation of Standards on Plastics reflects the rapidly growing pace of the plastics industry. This edition contains a total of 213 standards, of which 22 are entirely new, and 23 have been revised or changed in status. In addition to all of the standards prepared by ASTM Committee D-20 on Plastics this book includes selected standards from other committees, which should be of interest to those in the plastics field.

Among the topics covered are Specifications for Molding Compounds and Base Materials; Standard and Molded Shapes; Mechanical Properties of Plastics; Effects of Radiation; Thermal Properties of Plastics; Optical Properties of Plastics; Permanence Properties of Plastics; Analytical Methods for Plastics; Molds and Molding Processes for Plastics; Definitions and Nomenclature of Plastics; Conditioning of Plastics; Electrical Insulating Materials; Rubber and Rubber-Like Materials; Adhesives; Color and Gloss Tests; and Miscellaneous Subjects.

"Polymer." Vol. 1, No. 1. Buttersworth Publications, Ltd., London, W.C.2, England. March, 1960. 124 pages. Annual subscription, $15.00 (£5).

This new quarterly has been founded to provide an international medium for the publication of original papers on the chemistry, physics, and application of polymer research, and on other disciplines which contribute to the development of polymer science. A substantial research effort is now devoted to this field, and it is felt that the number of papers written has become so large as to justify a journal for their publication.

A feature of the journal will be the publication of short communications dealing with work which merits publicity before a full paper can be prepared and published. These communications, like the papers, will be edited by working editors of wide experience. Manuscripts are invited for publication. Contributions should be sent to the editors, "Polymer," 4-5 Bell Yard, London, W.C.2, England.



Technical Books

NEW PUBLICATIONS

"Huber Calcined Clays for the Rubber Industry." J. M. Huber Corp., New York, N. Y. 6 pages. This bulletin presents the physical and chemical properties of Polyfil 40, 70, and 80 calcined kaolin clays and shows the relative reinforcing effects in SBR, neoprene, butyl, and natural rubber. Important applications of calcined clays are in the electrical insulation field and in light-colored calendered, molded, and extruded PVC and rubber compounds.

"Engineers' Guide to Silicones." Dow Corning Corp., Midland, Mich. 12 pages. This engineering guide explains how various physical forms of silicones contribute to reliability, miniaturization, modularization and environmental protection; increase serviceability over wide extremes of temperature; and aid engineering. The index includes encapsulants, impregnating and coating materials, molded rubber parts, potting and filling materials, etc.

"Tenamene 3—Eastman Industrial Antioxidant." Bulletin No. I-107. Eastman Chemical Products, Inc., Kingsport, Tenn. 16 pages. This brochure discusses the applications of Tenamene 3 (2,6-di-tert-butyl-p-cresol) as an industrial antioxidant. Performance charts and graphs illustrate the effectiveness of this antioxidant for such materials as rubber, elastomers, polyethylene, and others. Miscellaneous industrial applications are described, and complete data on the physical properties of Tenamene 3 are presented in tabular form.

"Compounding Natural Rubber for Service at Low Temperatures." Technical Bulletin No. 4. Technical Service Department, Natural Rubber Bureau, Washington, D. C. 26 pages. This bulletin describes a new modified natural rubber which makes possible NR compounds that remain effective at temperatures below −60° C. This effectiveness was made possible by (1) the incorporation of plasticizers which serve to counteract rapid stiffening that occurs at low temperatures, and (2) chemical modification of the natural rubber which results in marked retardation in the slow progressive stiffening that occurs at moderately low temperatures.

"Robinson Knife Cutters." Bulletin K-460. Robinson division, The Young Machinery Co., Inc., Muncy, Pa. The bulletin describes the company's complete line of rotary cutters. Available in stainless steel as well as carbon steel, this knife cutter, when equipped with roll feeders, is being used for cutting plastic paper sheets and to trim polyethylene and cellophane film and similar materials to a uniform particle size.

"'U.S.' Drum Mixing Equipment." Bulletin DM-290. Process Equipment Division, U. S. Stoneware Co., Akron, O, 12 pages. This bulletin highlights an expanded line of five standard sizes of "U.S." heavy-duty fiber drum tumblers now available with new design features such as quick-release drum holders, floor-level loading and built-in drum extenders. The literature also contains illustrations and specifications for drum rollers, conical blenders, Tumblemixers, "Rocker-Roll" mixers, and other special units and accessories for performing all types of drum mixing and blending operations.

"Instructions for Using Tempilstiks." Tempil Corp., New York, N. Y. 1 page. This revised data sheet contains a number of useful suggestions for determining temperatures in industrial applications by means of Tempilstiks, temperature-sensitive crayons of calibrated melting points. These suggestions include checking temperatures of rotating parts, obtaining the temperature distribution of a surface, checking the temperature of a cooling object. Tempilstiks are available in 80 systematically spaced temperature ratings from 113 to 2,500° F.

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To protect rubber goods against weather and flex cracking, a unique anti-ozonant, anti-oxidant and anti-suncheck agent, **OZONO** is now being offered to the rubber industry.

Manufactured by a new special process, **OZONO** affords better ozone, oxygen and sun cracking protection than mixtures of commercial anti-ozonants and waxes used separately. Tests show that an equal degree of protection is obtained at **OZONO** concentrations at appreciably smaller costs than with the amounts of commercial agents normally used.

Showing excellent protective value against heat, oxygen, fatigue flexing, copper deterioration and ozone cracking, **OZONO** is made in a form which simplifies its incorporation into rubber stock in an internal mixer or on a mill.

Recommended for use on such stock as tire carcass, inner tubes, footwear, molded heels or soles, sundries, sponge, automotive rubber, wire insulation, tubing, and all rubber goods exposed to the elements.

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An experimental sample is yours by request on company letterhead - - write to

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"Shell S-Polymers in Shoe Soles." SC60-24. Synthetic rubber division, Shell Chemical Co., Torrance, Calif. 12 pages. This bulletin gives formulations and describes the applications of Shell styrene-butadiene polymers in nuclear, casual, and specialty soles. These formulations, showing different quality levels, are designed to be used either directly, as given, or modified to meet special requirements of color, cost, or physical properties.

"Cydac Accelerator Flaked." Rubber chemicals department, American Cyanamid Co., Bound Brook, N. J. 4 pages. This bulletin covers the general chemical and physical properties, specifications, compounding characteristics, uses, and analytical test methods for Cydac Accelerator Flaked (N-cyclohexyl benzothiazole-2-sulfenamide). Cydac is a general-purpose delayed-action accelerator for use with natural and styrene-butadiene rubbers.

"Parmatic Speed Variator." GEA-7012. General Electric Co., Schenectady, N. Y. 8 pages. This bulletin describes General Electric's new Parmatic Speed Variator, a compact packaged adjustable-speed d.c. motor drive that operates from a.c. power. The new drive, featuring static power conversion, utilizes sealed silicon rectifiers and saturable reactors and has undergone extensive field testing. The new unit is suitable for a wide variety of drive applications, including such industries as rubber, plastics, textile, and others.

"Handling C_4 Hydrocarbons." Petro-Tex Chemical Corp., Houston, Tex. 36 pages. This manual is designed for the purchaser of one or more of Petro-Tex's C_4 hydrocarbons and includes information on shipping methods and regulations, cylinders, general unloading techniques, tank trucks, tank cars, tank barges, fire, explosion, and toxicological hazards, physical properties, and a bibliography. While this manual deals specifically with four principal pressurized liquid hydrocarbons, the data and references apply broadly.

"Electrical Engineering Problems in the Rubber and Plastic Industries." T-118. American Institute of Electrical Engineers, New York, N. Y. 190 pages. Price $4.00. This booklet includes 14 technical papers and discussions which were presented at the eleventh AIEE Conference on Electrical Engineering Problems in the Rubber and Plastics Industries, Akron, O., April 22-24, 1959. Papers covered controls and drives for tire cord and fabric and rubber processing operations, semi-conductors, induction heating and heating problems. Trends in new machines and processes, the Aetnamatic Mill, effects of radiation, atmospheric contamination, and motor controller standards are other topics discussed.

"Engineering Guide—Dow Corning Silicones." Dow Corning Corp., Midland, Mich. 16 pages. This engineering guide to the forms, properties, and applications for the company's silicone products covers such materials as adhesives, mold release agents, Silastic silicone rubbers, defoamers, etc. References to literature available from the company also are provided.

Publications of B. F. Goodrich Chemical Co., Cleveland, O.:

"Hycar Technical Newsletter." Vol. IX, No. 1, March, 1960. Sections in this issue include "Hycar Compounds for Body and Motor Mounts," "Oil and Heat Resistant Hycar 1203 and 1042 Compounds," "Test for Gas Penetration," and "Hycar Coated Fabrics." Formulations and vulcanizate properties are presented in detailed tabular form.

"Hycar Rubber and Latex." 12 pages. This brochure lists the properties and applications of the company's Hycar rubber and latices. Included are Hycar nitrile rubber (general purpose), Hycar carboxy nitrile rubber for severe abrasion conditions, Hycar polyacrylic rubber for extreme high temperature, Hycar brominated butyl rubber, Hycar styrene rubbers and resins (thermoplastic, wide hardness range), and Hycar latices (coating, impregnating, saturating porous materials).

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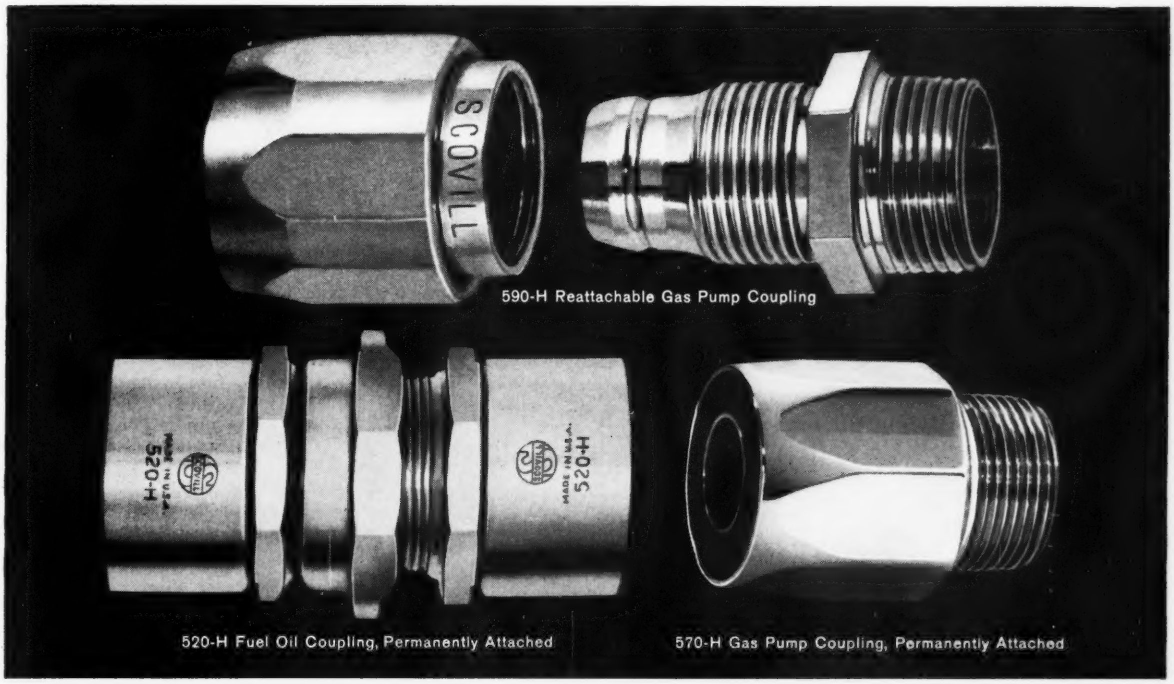

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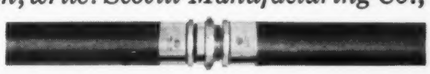

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Publications of Columbia-Southern Chemical Corp., Pittsburgh, Pa.:

"Hi-Sil X303." Hi-Sil Bulletin No. 2 (Rev.). 1 page. Hi-Sil X303, a hydrated silica developed especially as a reinforcing filler for silicone rubber stocks, is described. Typical chemical and physical properties are reported.

"Hi-Sil 233." Hi-Sil Bulletin No. 4. 1 page. Typical properties appear for Hi-Sil 233, a quality reinforcing silica used in formulating top-quality non-black rubber goods. Other applications are listed.

"Calcene CO." Calcene Bulletin No. 3. 1 page. Typical properties of Calcene CO are given. The material is a fine particle, precipitated calcium carbonate pigment, surface coated to increase ease of dispersion in rubber compounding.

Publications of The British Rubber Producers' Research Association, Welwyn Garden City, Herts, England:

"Reaction of Thiosulfate Ion with Tetraethylthiuram Disulfide Promoted by Some Metal Cations." No. 330. By B. Saville. 4 pages.

"Nucleotides of *Hevea Brasiliensis* Latex. A Ribonucleoprotein Component." No. 331. By A. I. McMullen. 6 pages.

"*Cis-Trans* Isomerization in Polyisoprenes. Part III. Reduction in the Rate of Crystallization of Natural Rubber at Low Temperatures by Treatment with Sulfur Dioxide." No. 332. **"Part IV.** Conversion of Gutta Percha to a Polymer Which Is Rubber-Like at Room Temperatures." No. 333. 6 pages. Both parts by J. I. Cunneen and W. F. Watson.

"Improved Equipment for the Measurement of Interfacial Potentials." No. 334. By C. D. Kinloch and A. I. McMullen. 3 pages.

"Rubber Bearings for Bridges—Design Considerations." A. N. Gent. 4 pages.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.:

"Wire and Cable Casebook." A-13769. 4 pages. This bulletin is a periodic report on the use of neoprene synthetic rubber in the electrical industry. Case histories are presented as well as the electrical properties of typical neoprene insulation.

"Simulated Service Test 12: Industrial V-Belts." Elastomers Notebook No. 93. 8 pages. This brochure describes a rubber company's method of testing its V-belt, employing a quantitative simulated service technique. Other articles cover "Viton" heavy-duty shock mounts, "Adiprene" pallet wheels, "Hypalon"-lined hose for piping sulfuric acid, and urethane foam seat cushions for helicopters.

"High Velocity Dryers." Bulletin No. HV-501. J. O. Ross Engineering, Division of Midland-Ross Corp., New York, N. Y. 4 pages.

"Achieving Better Designs with Custom-Built Elastomers." Bulletin No. 902. Lord Mfg. Co., Erie, Pa. 6 pages.

"Solid Cotton Belting—Standards, Characteristics, Applications." Woven Fabric Belting Manufacturers Association, New York, N. Y. 18 pages.

"Outstanding Service in Rubber Compounding and Molding." Bulletin C-60. Colonial Rubber Co., Ravenna, O. 16 pages.

"Engineer." Engineers Joint Council, New York, N. Y. A new mass circulation newspaper for engineers.

"1960 Yearbook." The Tire & Rim Association, Inc., Akron, O. Price $3.50.

"Lenz Tube Fittings." The Lenz Co., Dayton, O. 118 pages.

"Monsanto Acrylonitrile." Plastics division, Monsanto Chemical Co., Springfield, Mass. 16 pages.

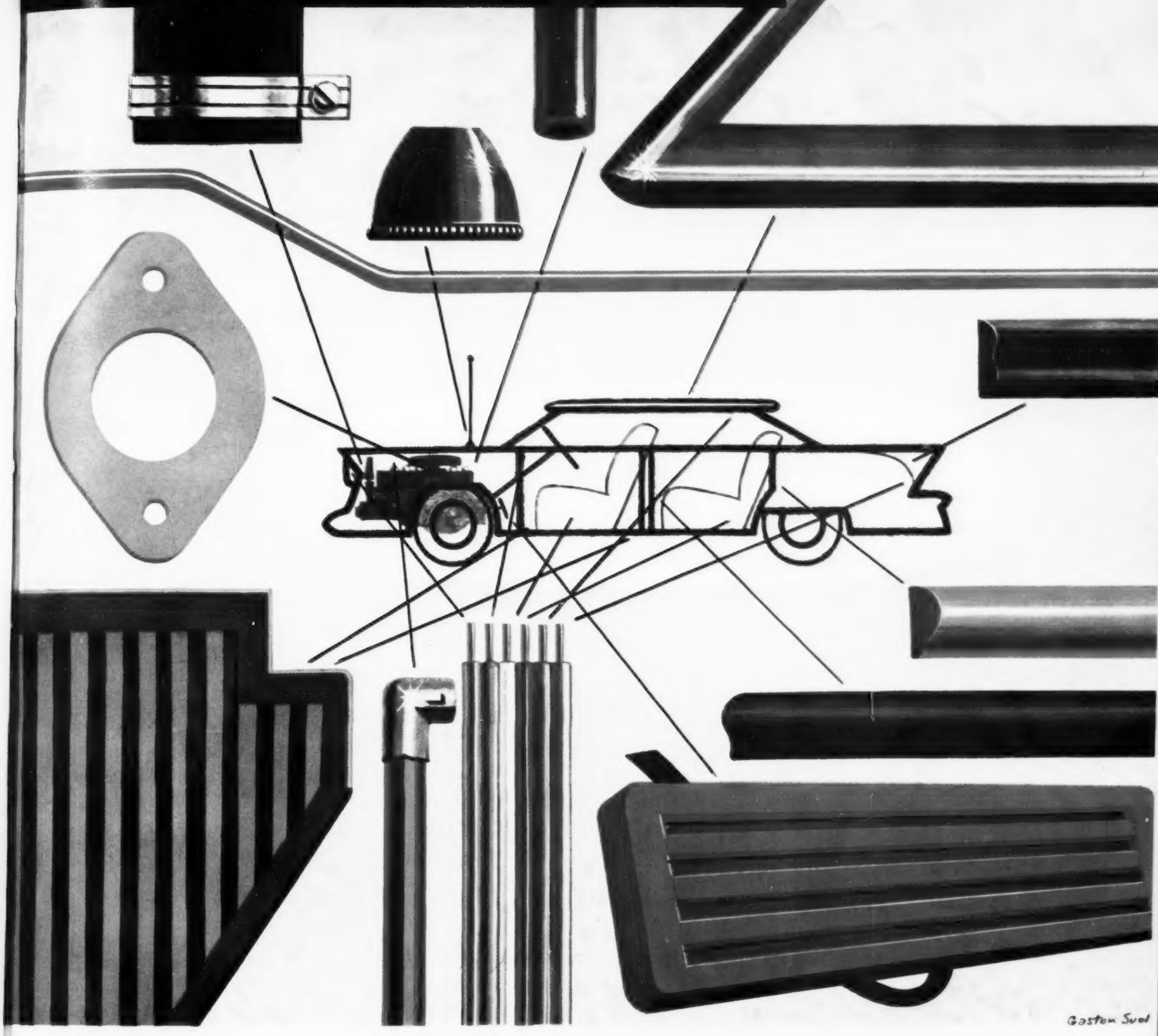
"Genetron Blowing Agents." (Two bulletins.) General Chemical division, Allied Chemical Corp., New York, N. Y.

"Tri-Clad Motor Selection and Buying Information." Bulletin No. GEC-1049. General Electric Co., Schenectady, N. Y. 14 pages.

(Continued on page 146)

Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



Great new advance in automotive rubber

Here is a new rubber that's unmatched for oil, weather, and abrasion resistance. It's new PARACRIL® OZO, the finest achievement yet in the nitrile rubber field. PARACRIL OZO's properties are tailor made for many modern automotive parts—for everything from weather stripping to oil seals and hose. PARACRIL OZO gives you a whole series of important advantages, including:

- significantly superior ozone resistance
- excellent fuel and oil resistance
- several times greater abrasion resistance
- permanent retention of bright colors for exterior styling and easily traceable wiring and other interior parts

Look into PARACRIL OZO. Discover for yourself its new design possibilities...its unlimited color...its high quality. Contact your nearest Naugatuck representative at the address below.

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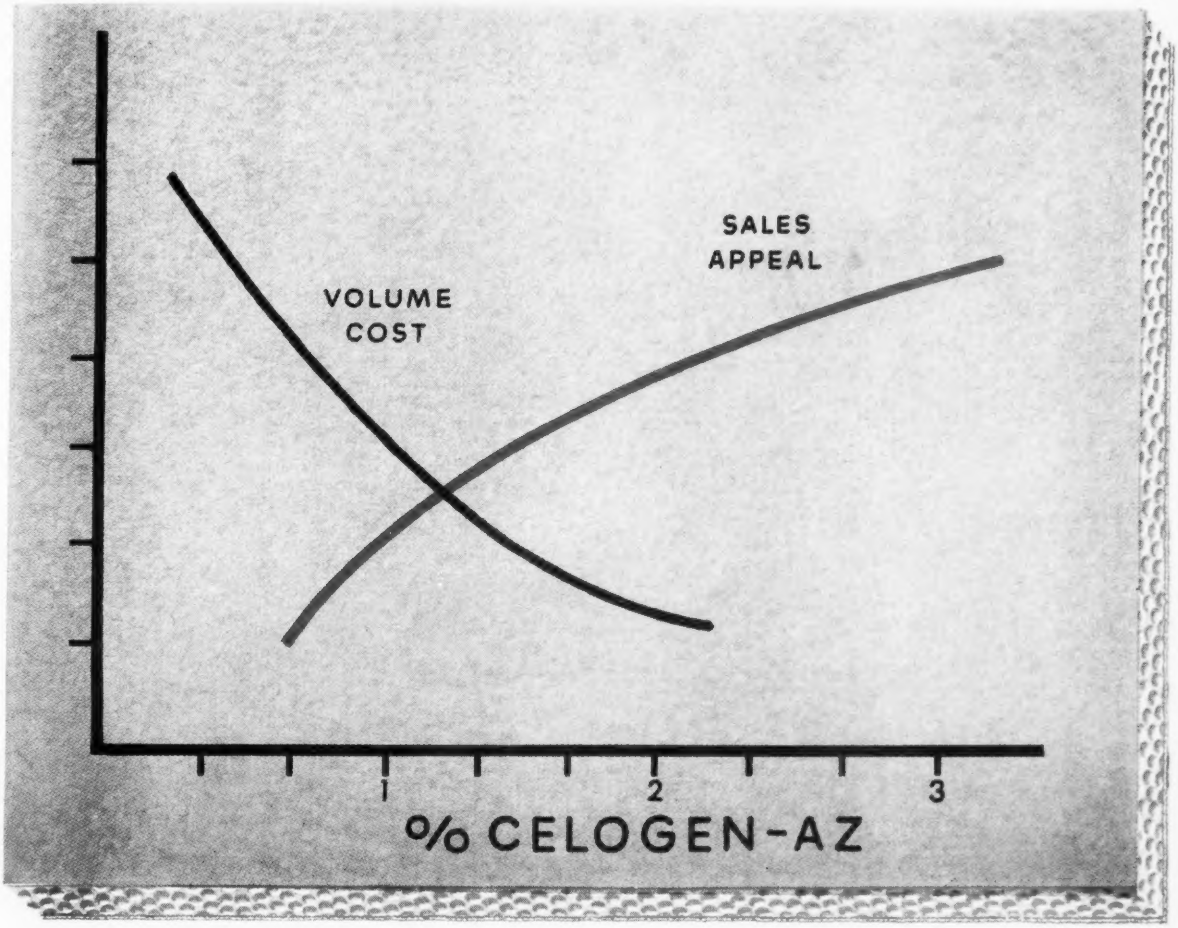
Naugatuck CELOGEN-AZ

BY A WORLD LEADER IN CHEMICAL BLOWING AGENTS



Blow new life into vinyl product sales

CELOGEN-AZ® is the special chemical blowing agent that has given vinyl products an entirely new kind of sales-making performance. *And it can reduce product costs as well.*

Vinyl sheeting expanded with CELOGEN-AZ has wonderful new hand...a luxurious feel and drape that rivals the finest fabrics and leathers. It is lighter, softer, more flexible.

Vinyls blown with CELOGEN-AZ have greatly increased resilience, a cushioning effect that is ideal for products ranging from table covers to floor tile. CELOGEN-AZ blown vinyls insulate better electrically and help deaden sound. They can be given a wide range of buoyancy.

Most important, CELOGEN-AZ produces no undesirable side effects, no unpleasant odors. The rubber industry proved it. It offers entirely new product-selling opportunities to you.

Discover the advantages of CELOGEN-AZ in your own vinyl or other plastics products. Contact your nearest Naugatuck Representative or the address below.

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TITANOX® helps bring smiles to the kitchen

Rubber and plastic products bring smiles to the kitchen. And TITANOX white titanium dioxide pigments, in turn, bring smiles to compounders and processors of all types of rubber and plastics.

For TITANOX pigments, particularly TITANOX-RA, help maintain efficiency in production and uniformity of white and light colored products that make consumers happy.

There's a rutile or anatase titanium dioxide white pigment in the TITANOX line not only for household goods, but for any rubber or plastic composition. Our Technical Service Department will be happy to help you select the proper one. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities. In Canada: Canadian Titanium Pigments Ltd., Montreal.

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Investigate these advantages of **RECLAIM** for adhesives

In adhesive applications by the dozens, you can do the job at least as well, often better, and frequently *reduce your costs* by the use of Naugatuck Reclaimed Rubber especially processed for adhesive applications. Investigate these important advantages:

Stable low cost · High uniformity · Shorter mixing time · Faster processing · Excellent aging characteristics · Good resistance to heat flow · Good sprayability · High stability · Good film tack · Good adhesion to a wide variety of materials, including metals, fabric and wood.

The variety of Naugatuck Reclaimed Rubbers available, including low-staining grades for such applications as pressure-sensitive tape, is fully described in Naugatuck's informative booklet, "Reclaimed Rubber." Send for your copy today.

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NEW EQUIPMENT

In operation, the material is attached to the threading bar of the first-deck conveyor and carried into the oven at the rate of 40 feet per minute. When 75 feet of it are fed in, the material is cut, and another 75 feet are fed in similar fashion into the second deck of the unit. Rapid cooling at the end of the cure is provided by a damper on the running exhaust fan, starting a second fan, then opening fresh air dampers of the three zones and closing the recirculating air dampers. The sequence enables temperatures of the curing oven to be dropped to below 200° F. before the next load of material is fed in.

Continuous Process Curing Unit

A system of handling spongy, plastic materials in the form of 75-foot-long sections, supplying an even, controlled heat for curing, plus rapid cooling, was worked out recently by the industrial equipment division of The R. C. Mahon Co., Detroit, Mich.

Embodied in an 80-foot, double-deck oven, the system enables Goodyear to handle such material in a continuous curing process. The oven is arranged to handle, and hold for eight hours or longer for curing, two seven-foot-wide sections of the material simultaneously at predetermined temperature up to 300° F. The oven processes the material directly from the producing machine, cooling it prior to discharging, then automatically coming up to heat again to handle the next load.

Success of the oven is attributed to the double-deck arrangement of the individually driven chain conveyors, the provision of three separate heating zones, and system of recirculating and exhausting required air for the final cure.

Steam through fin-type coils is employed for heat. The coils are located in insulated enclosures on top of the oven, along with distributing fans to circulate the required air about the material traveling through the oven.

Bristol Laboratory Recorder

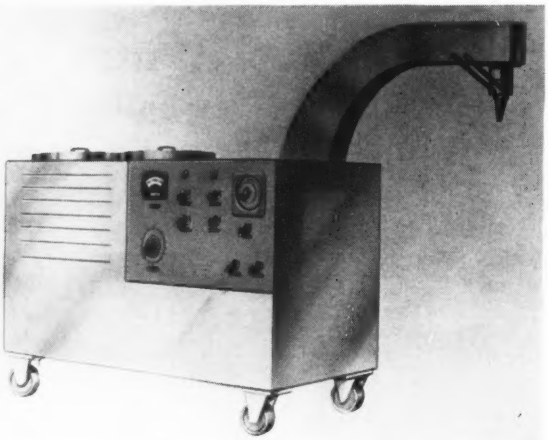
The Bristol Co., Waterbury, Conn., is now offering a new laboratory model of its Dynamaster Potentiometer Recorder. Basically, the instrument is the well-known wide-strip recording instrument especially adapted to laboratory requirements. The new multi-purpose recorder lends itself readily to measuring such variables as pressure, temperature, motion, flow, density, pH, and electric power.

Special input signal selection switches and span adjustments provide maximum flexibility. The four-position input selector switch provides for millivolt, volt, microampere, or milliampere input. The five-position span selector offers ranges 0-2, 0-5, 0-10, 0-25, and 0-50. An alternative span continuously adjustable from 0-2 to 0-50 is available.

An adjustable zero and push-button standardization are standard. Automatic standardization (especially desirable for long-duration tests) is optional.

Some of the attachments offered include a dual-speed chart-drive, or a multi-speed drive (six speeds); a time-pen (convenient for marking reference points in testing); chart-footage indicator (shows amount of unused chart); manual chart-rewind (for easy comparisons); manual or electric pen-lifters; and retransmitting slidewires.

New Equipment



In this new machine for producing urethane foam all components are mounted integrally in one compact mobile unit. Designed for simplicity of operation, the unit is available from Rogers Associates, Inc., West Caldwell, N. J. Capacity range of the unit is from 1½-pound to 80 pounds per minute. An optional portable head permits dispensing of foam 50 feet from metering unit. The unit is available with either intermittent or continuous delivery and is said to give exact metering of foam components, no matter what the ratio of these components might be

Rex Model 1500 Hardness Gage

An improved, accurate hardness gage, called the Rex Model 1500 for measuring the hardness of rubber and plastic materials, has been announced by Rex Gauge Co., Glenview, Ill.

This new gage indicates hardness in durometer units that comply with ASTM specifications for rubber hardness. The vernier reads directly to 5 points which permits interpolation to about 2 points with average vision. Runner is pushed down for new readings in a manner similar to a tire gage.

The gage is said to remain accurate during its lifetime, regardless of usage. It has a hardened steel indentor, made to close tolerances, which contacts the material being tested. The indentor pushes up the runner of the vernier by direct contact. The runner is then held by friction, permitting the instrument to be removed and read elsewhere.

The gage weighs 1½ ounces, comes in a leather case, and has a lifetime guarantee.

Additional information is available from the manufacturer.

New Welding Gun for Thermoplastics

A new universal welding gun for a variety of thermoplastic materials, designated the Allen-Universal welding gun, is now available from the Esto Mfg. Co., Inc., Allentown, Pa. The gun is designed for the hot-gas (air welding method of polyethylene, polypropylene, and rigid and plasticized polyvinyl chloride). The basic tool is adapted to the various types of welds by easily interchangeable tips and attachments.

The basic construction of this tool includes (1) light weight (12 ounces); (2) all stainless-steel construction; (3) heavy high-grade Ni-Chrome heating elements, easily removed and replaced with a screwdriver; and (4) an air-cooled handle, which permits use of the gun at high welding temperatures.

Additional information and a bulletin describing the special features and attachments for the welding gun are available from the manufacturer.

ACCELERATORS AND VULCANIZING AGENTS

METHYL ZIRAM, ETHYL ZIRAM, BUTYL ZIRAM —Aqueous dispersions containing 50% active accelerator, readily blended into latex compounds. Active ultra accelerators for both Hevea and SBR latices.

MERAC®—A liquid activated dithiocarbamate-type ultra accelerator. Provides high modulus, high tensile, flat cures and good aging for natural and synthetic latex compounds.

PENNAC® SDB—47% active aqueous solution of sodium dibutyldithiocarbamate. A fast curing primary accelerator which provides high modulus and rapid precure to SBR and Hevea compounds

DISPERSED SULFUR—70% active sulfur dispersion. The standard vulcanizing agent in a convenient form.

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PENNOX® C—Nonstaining, nondiscoloring hindered bisphenol. Provides unusual resistance to discoloration on sunlight exposure.

PENNOX D®—Nonstaining, nondiscoloring hindered bisphenol. Good general purpose antioxidant for film and foam goods.

For compounding data and more detailed descriptions write for a copy of our Rubber Chemicals Catalog, S-156. Industrial Chemicals Division, PENNSALT CHEMICALS CORPORATION, 3 Penn Center, Philadelphia 2, Pa.

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Type PC-6 Temperature Controller

The new-type PC Chromatrol electronic controller, manufactured by Edwin L. Wiegand Co., Pittsburgh, Pa., gives highly sensitive temperature control, within 1° F., in a range from 25 to 600° F. The stainless-steel sensing element is a very small bullet-probe only one inch long and ¼-inch in diameter. The preaged thermistor probe may be located in platens, in air ducts, and in immersion wells up to 100 feet away from the amplifier-relay cabinet, using inexpensive light-gage twisted lead wire.

Loads up to 10 kw. can be controlled directly without a separate magnetic contactor. The instrument may be used on 120, 208, or 240 volts, 60 cycles. Its scale covers dual-range from 25 to 225° F. or 200 to 600° F. The dial-plate control is removable from the amplifier-relay for remote location up to 30 feet away. Thus all controls may be mounted at a single location.

Additional information and a sales data sheet, PK-100, are available from the manufacturer.

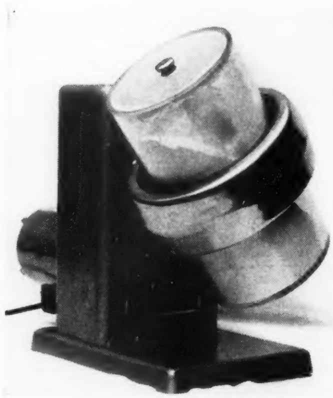
Series "250" Hydraulic Presses

Series "250," a new line of precision hydraulic presses designed for extremely accurate molding or laminating tolerances, has been announced by Atlas Hydraulics Division, Delaware Valley Mfg. Co., Philadelphia, Pa. Molding tolerances can be accurately maintained on thin walls, long or deep draws, and on tough or highly loaded compounds because of an ultra-heavy-duty frame. Uniform flash points can be maintained throughout the entire platen area, reports the manufacturer.

Through the use of transfer molds, each cavity is evenly pressurized because parallel platen closing is achieved with the new 45-degree precision guides. The presses are built as complete self-contained units in small laboratory sizes from 12- by 12-inch-size platens to larger production sizes of 24- by 24-inch platens. Capacities of the presses range from 50 to 300 tons.

Platens may be electrically or steam heated, with indicating or recording type of controllers in any desired temperature range Pumping unit controls may be manual, push-button, or semi-automatic. Special characteristics or controls are available to suit individual requirements.

New TMI Laboratory Rotomixer



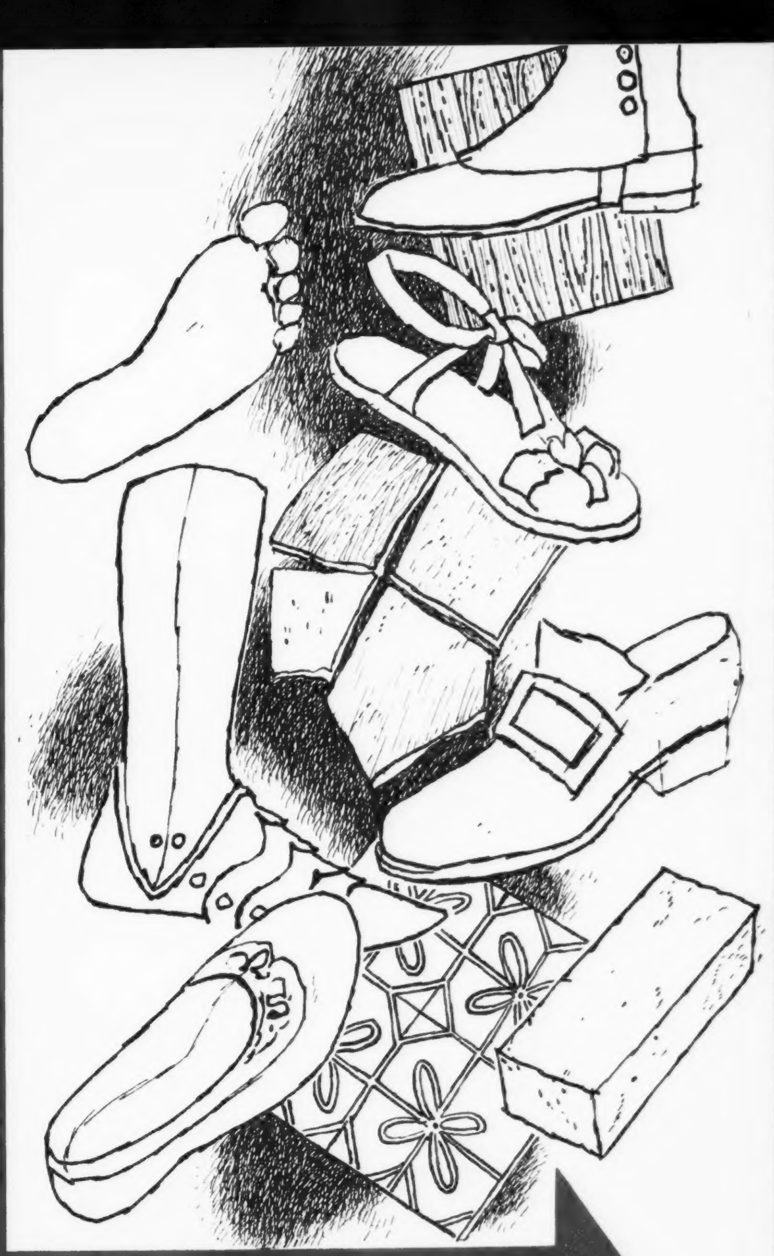
Testing Machines Rotomixer

A laboratory Rotomixer with mechanical characteristics that assure complete mixing has been announced by Testing Machines, Inc., Mineola, L. I., N. Y. The mixer has a unique design and rugged construction to meet the most exacting requirements for mixing small or fairly large batches.

Inside dimensions of the mixing chamber are 6½-inch diameter and 12-inch length. The chamber is made of thick, clear plastic; so the mix can be observed. This chamber is instantly removable from its mounting.

The Rotomixer is said to have exceptionally high efficiency because the mixing chamber rotates in two changing planes simultaneously. This feature accomplishes the complete and perfect compounding.

(Continued on page 143)



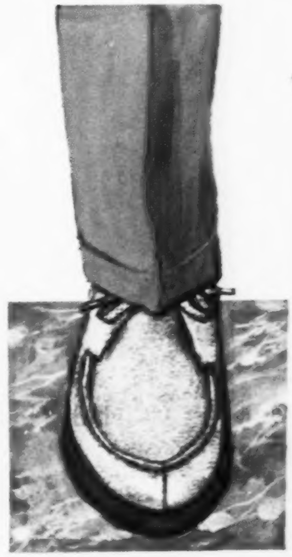
Some useful information for the men who shape the things we stand on...

1300 A.D.—When the Mayan dandy wanted shoes he simply milked a rubber tree and used his foot for the mold. Use of *shoe soup* was free to all. The style was crude; the fit perfect.

1776 A.D.—Freedom of the feet came fast on the heels of tyranny with light, comfortable walking shoes and smooth, quick-drying brick walks. It was an era of advanced "understanding."

1890 A.D.—Patent leather shoes with spats on slick parquet floors marked a night out during the Gaslight Age. Elegance outweighed wear and corns were epidemic.

1960 A.D.—Ultimate in "footwork" is the comfortable shoe sole made with an S-Polymer. S-Polymers also give us handsome, long-wearing rubber tile, luxurious sponge rug underlay, and dozens of other products.



today's "footwork"

transfer from the most intricate mold to the finished product.

Reduced Mixing Time . . . Your in-plant mixing time is significantly reduced with SP-103 because the resin is added at the latex stage and is thoroughly dispersed.

Reduced Scorch . . . When you use SP-103 instead of mixing in clear resins yourself, there is less tendency to scorch because shorter mixing time is required, making possible lower mixing temperatures.

Convenience and Economy . . . SP-103 comes to you in free-flowing crumb form, minimizing loss of material and dust problems encountered with clear resins.

SHELL CHEMICAL COMPANY

SYNTHETIC RUBBER DIVISION

P. O. Box 216, Torrance, California

Shoe-sole manufacturers are finding two recent technical bulletins helpful. Just fill out and mail the detachable postcard. Do it now—no stamp is necessary.

SHELL

SHELL CHEMICAL COMPANY:

I would like to receive the following bulletins:

- [ ] **MICROCELLULAR SPONGE SOLING** (SC:59-27) contains formulations and data on the effects of precure and postcure on shrinkage, specific gravity and hardness.
- [ ] **S-POLYMERS IN SHOE SOLES** (SC:60-24) gives a variety of formulations for shoe soles from oak to athletic soles.

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Company________________ Title________

Address____________________

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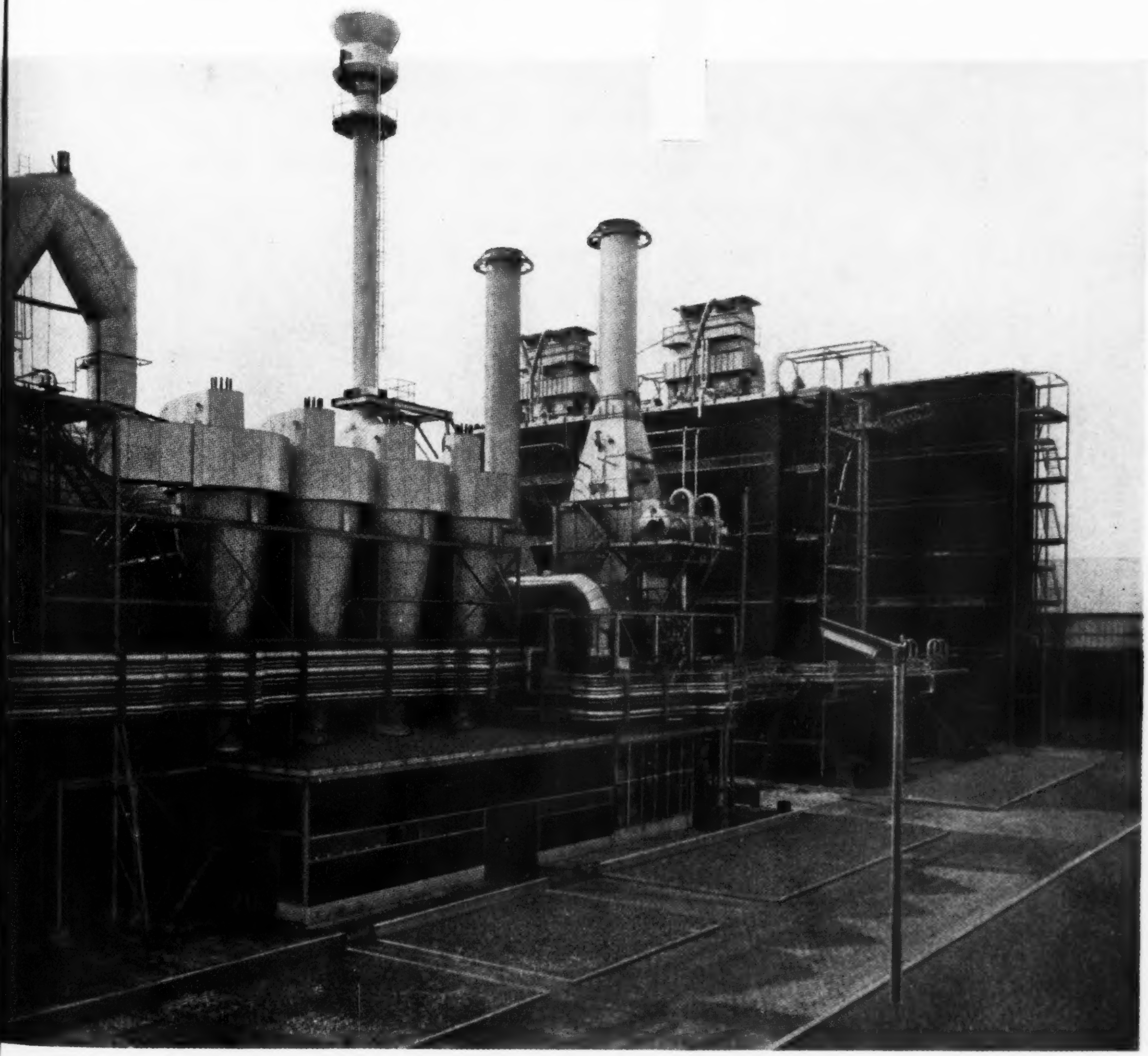

Call Hall

HALLCO NEWS

Issued by
The C. P. Hall Co.
Chemical Manufacturers

No. 10

USERS REPORT STABILITE GIVES OUTSTANDING RESULTS AT LOWER COST

Unlike the majority of antioxidants, Stabilite shows a measurable beneficial effect on ozone resistance, as reported by a manufacturer of tires used on automotive farm equipment. In combination with a petroleum wax Stabilite further improved anti-checking properties. Another tire company in an airbag application uses 3¼ parts of Stabilite to 100 of rubber hydrocarbon. It obtains these beneficial results:

- **Better splicing due to Stabilite's plasticizing action.**
- **Better adhesion to metal valves.**
- **Better surface condition in use because Stabilite stays smooth longer.**
- **Reduction of circumferential cracking.**
- **Improved handling before curing.**
- **Lower cost.**

Still another tire manufacturer finds that Stabilite, used in the cushion stock containing natural rubber, produces excellent adhesion and shows less tendency for tires to lose their treads. This company credits Stabilite's peptizing action for the improved adhesion obtained. Stabilite added at the beginning of the mixing cycle of GR-S effectively reduces "nerve" and dryness, improves tack and prevents gel formation.

For further information and samples write: The C. P. Hall Co., Akron 8, Ohio, Exclusive distributors for Chemeco, Inc., manufacturers.

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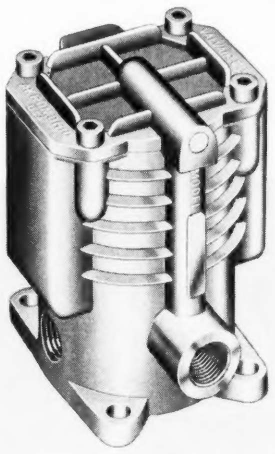
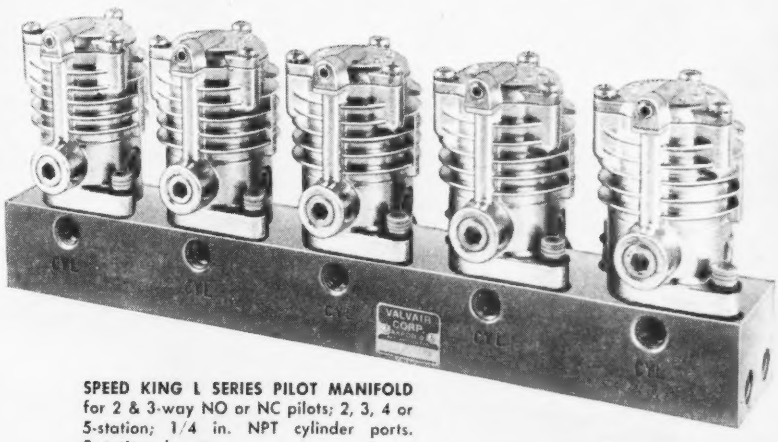
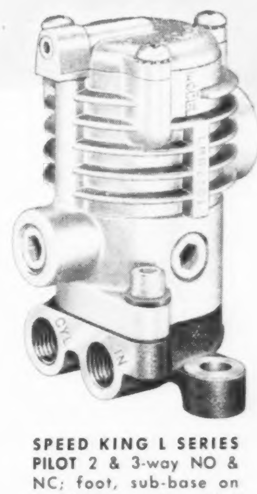


SPEED KING P SERIES PILOT 2 & 3-way NO & NC, 4-way; foot, sub-base or manifold mounting; 1/8 or 3/16 in. orifices. Foot mounting shown.



SPEED KING L SERIES PILOT MANIFOLD for 2 & 3-way NO or NC pilots; 2, 3, 4 or 5-station; 1/4 in. NPT cylinder ports. 5-station shown.



SPEED KING L SERIES PILOT 2 & 3-way NO & NC; foot, sub-base on manifold mounting; 1/16 to 1/8 in. orifices. Sub-base mounting shown.

Compact Valvair® SPEED KING pilots are ideal for control of small air or vacuum-operated devices including cylinders up to 3 in. bore, as well as for piloting larger valves. Featuring Valvair's flow-thru cooling design, they offer multi-million cycle dependability, with solenoid coils guaranteed against burn-out for the life of the valve. Choose from a full range of types, mounting styles and sizes; integral junction boxes (L Series only) and manual over-ride optional; coils for ac or dc, any voltage.

Solve your small unit control problems with SPEED KING solenoid pilots. Your Valvair or Bellows Field Engineer can recommend a size and type exactly suited to your requirements.

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There's less chance of shipping delay with Witco-Continental carbon blacks. We print your purchase order number, code or pigment number, type of black and other information, on every bag. Result is easier inventory, checking and handling.

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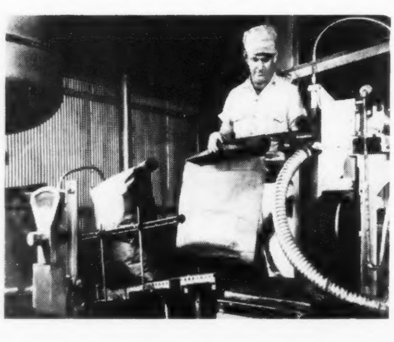

Valve bags mean better unit loading, cleaner warehousing, faster and easier handling. Witco-Continental's exclusive patented valve filling machines insure greater uniformity of outside bag dimensions.

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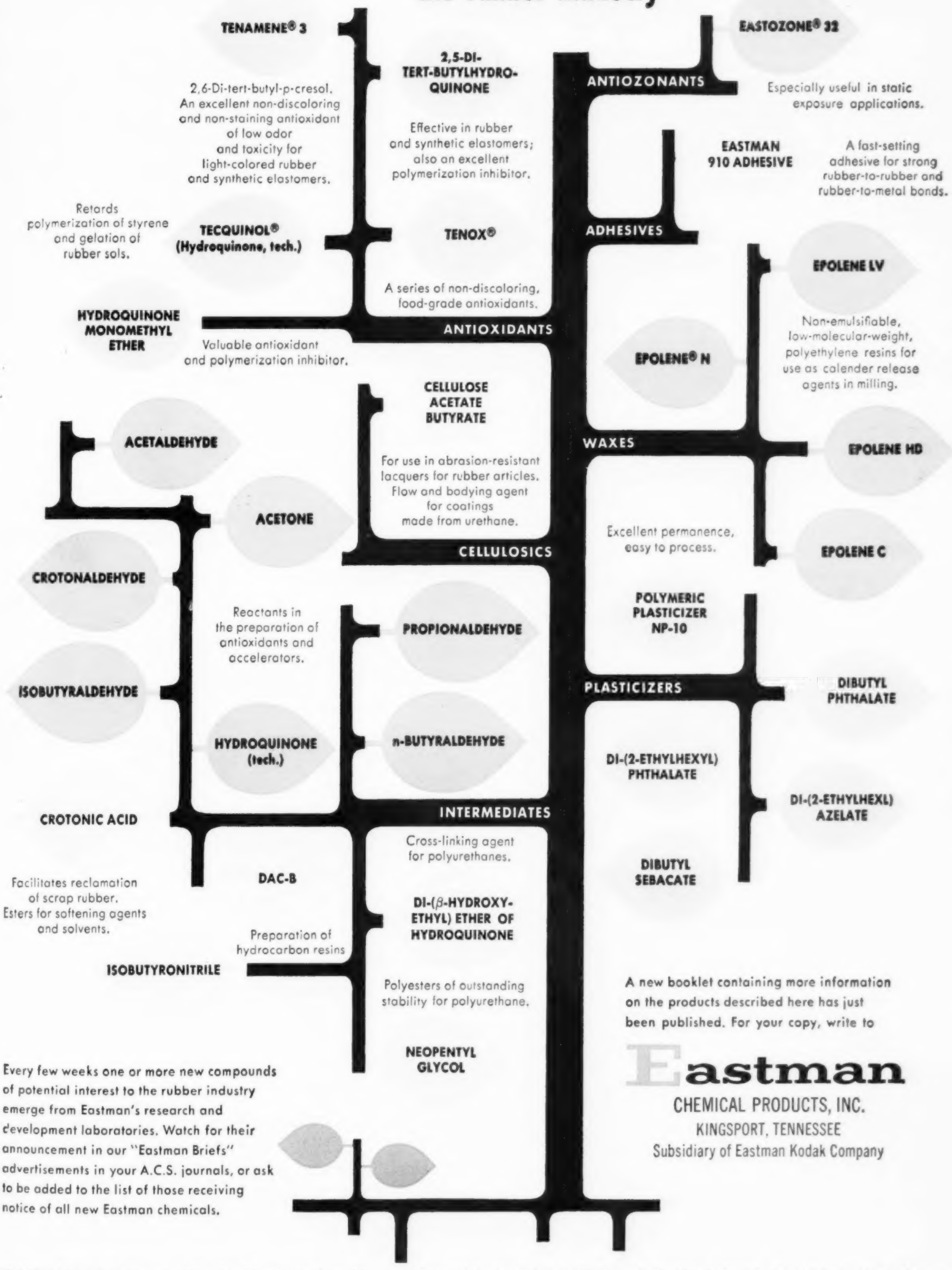

Every few weeks one or more new compounds of potential interest to the rubber industry emerge from Eastman's research and development laboratories. Watch for their announcement in our "Eastman Briefs" advertisements in your A.C.S. journals, or ask to be added to the list of those receiving notice of all new Eastman chemicals.

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RUBBER WORLD

EDITORIAL

Synthetic Rubber Producers Trade Association Needed?

ACTIVITIES in connection with the reorganization and coordination of the efforts of the producers of natural rubber, particularly those in Malaya, in the fields of research and development and trading seem to be proceeding at an accelerated rate these days, or so it appears from the amount of information available. Meanwhile, although there is a vast amount of research and development and marketing activity going on in the synthetic rubber industry, the presentation of the results of this work does not seem to be attracting as much attention, by contrast.

The publicizing of the efforts of the Malayan natural rubber producers in the research and development fields has the advantage of being carried out by a centralized organization; while the efforts of synthetic rubber producers in the United States in this area have been publicized individually since 1955. The new Rubber Association of Singapore and Malaya, which combines the Singapore Chamber of Commerce Rubber Association, the Rubber Trade Association, and the Federation of Rubber Trade Associations in the Federation, is reported as being aimed at better coordination of trading interests in dealing with overseas markets and with the governments of Singapore and Malaya.

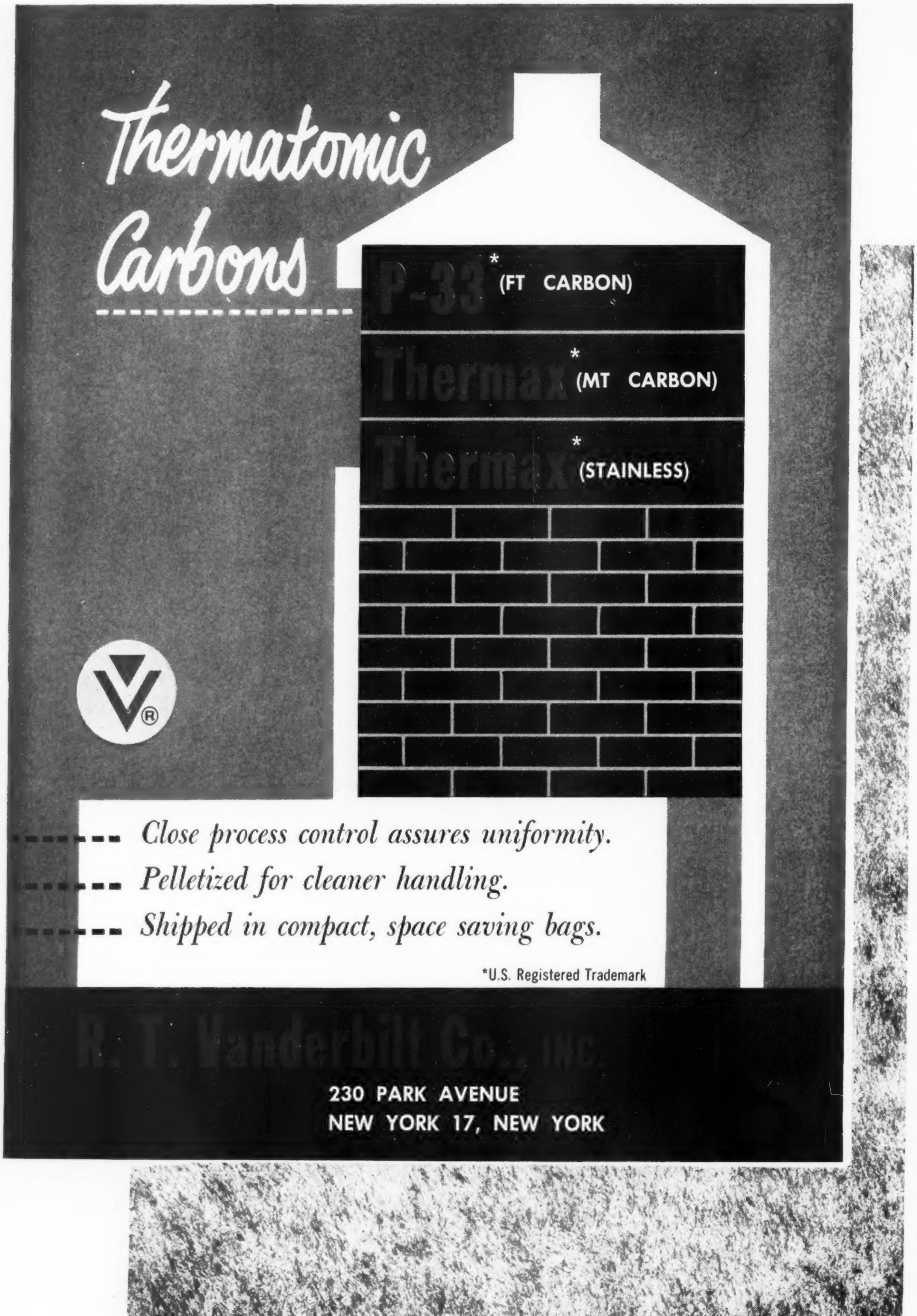
With research and development work on natural rubber both in Malaya and in England controlled by the Malayan Rubber Fund Board, and the results publicized by the Natural Rubber Development Board in England and by the Natural Rubber Bureau in the United States, this information could receive an increasing amount of attention throughout the world. Also, with a better coordinated system of trading in natural rubber from Malaya, improvements in marketing could result.

The point we are trying to make is that although it is desirable and necessary for synthetic rubber research and development and marketing to be carried out by each producer individually, at least in the United States, these producers might benefit by more coordination in the use of the results of their efforts, if, for example, they formed a trade association. Also, there are many problems of grading, specifications, shipping, and dealings with national, state, and foreign governments that could be more efficiently handled by a coordinated effort. In addition, there are certain aspects of public relations with customers and the public that are more efficiently handled on a collective basis.

The only overall source of information on the synthetic rubber industry in this country is the annual report of the Justice Department on "Competition in the Synthetic Rubber Industry," which will continue until 1966 at the request of the Congress. It would seem that there would be some merit to the synthetic rubber industry telling its own story, not once a year, but throughout the year, and dealing with government organizations and the public on a collective basis, in view of its continuing competition not only with natural rubber, but with plastic materials.

R. G. Seaman

EDITOR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Compounding Cross-Linked Polyethylene[1]

Polyethylene can be made a thermosetting material with many engineering possibilities while retaining most properties of thermoplastic state

By B. C. CARLSON
R. T. Vanderbilt Co., New York, N. Y.

UNSATURATION in most hydrocarbon polymers is considered necessary for cross-linking or curing. This cross-linking converts these polymers into thermoset, useful commercial products. The low degree of unsaturation in polyethylene, however, is insufficient to furnish enough reactive points to permit curing by conventional sulfur-accelerator systems.

It has been known for some time, however, that there are other types of curing systems for polyethylene. One of these involves the use of certain peroxides which form highly reactive free radicals upon decomposition due to heat. These free radicals, in turn, create active sites on the polymer carbon chains at which carbon-to-carbon cross-links can occur.

This curing system is then a means of converting a thermoplastic resin with its outstanding physical, chemical, and electrical properties into a thermoset material by compounding methods which are not materially dif-

[1] Presented before the New York Rubber Group, New York, N. Y., Mar. 18, 1960.

The Author

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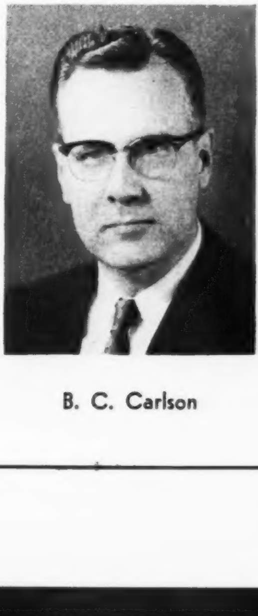


B. C. Carlson

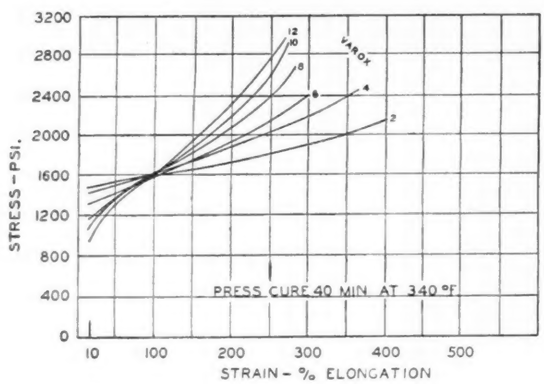


Fig. 1. Stress-strain of cross-linked polyethylene *vs.* Varox content under constant cure conditions

TABLE 1. CROSS-LINKED POLYETHYLENE ADVANTAGES

Improved Tensile Properties
Improved Heat Stability
Improved Heat Resistance
Wide Ranges of Hardness Values
Wide Ranges of Stiffness Values
Improved Impact Resistance for a Given Hardness
Improved Flex Resistance for a Given Hardness
Improved Solvent Resistance
Improved Resistance to Environmental Stress Cracking
Improved Low-Temperature Properties of Filled Compounds
Reduction in Material Costs Through Loading

ferent from the procedures used in rubber compounding. As a result, a new engineering composition with a wide range of properties, in most cases superior to those of the thermoplastic form, may be developed.

Table 1 illustrates in a general way the advantages which may be expected by means of proper compounding of polyethylene.

Polyethylene Resins

The properties and processing characteristics of thermoplastic polyethylene are related principally to the density and melt index. These characteristics are also of importance in compounding cross-linked polyethylene. The low-density resins have the lowest crystallization temperature and, therefore, are the most readily adapted to processing in rubber equipment. This discussion will, therefore, be limited largely to low-density resins.

Melt index is an empirical measurement of viscosity and measures the relative difference in molecular weight of resins.[2] This is done by determining the weight of melted resin which a weighted piston extrudes through an orifice in a specified period of time. During the measurement the temperature is held at 190° C. (374° F.). The melt index of the resin sample is the weight, in grams, extruded in 10 minutes. The melt index is of great importance in processing characteristics and in obtaining the desired physical properties.

Processing characteristics of the resins may be illustrated by Mooney scorch and viscosity[3] data for resins of 0.4, 2.0, and 20.0 melt indices in some typical compounds. These are shown in Table 2.

It is apparent from the scorch time that resins of high melt index are safer processing than resins of low melt index at the same level of peroxide. From the viscosity data smoother extrusions with less swell would be expected with high melt index resins. This point has been verified by laboratory extrusions.

On the other hand, a loss in certain physical properties such as tensile strength and impact resistance is obtained by the use of high melt index resins. This statement is illustrated in Table 3. Here we see a marked drop in the impact strength[4] (ASTM D256-56) when the melt index is increased.

The use of high melt index resins also will result in curing problems, particularly when little support is given the cured item. Sagging, swelling, and porosity are increased. The addition of fillers, however, decreases these tendencies.

Cross-Linking with Peroxides

Many organic peroxides decompose upon the appli-

TABLE 2. MOONEY SCORCH AND VISCOSITY AT 300° F. *vs.* MELT INDEX

	0.4 MI	2 MI	20 MI
Low-density polyethylene	100	100	100
Thermax* (MT carbon black)	50	50	50
Varox* (50% di-t-butyl peroxy dimethyl hexane)	4	4	4
Scorch T_5	9	13	26
Viscosity—MS 1 + 4	10	5	1

* Registered trade mark of R. T. Vanderbilt Co.

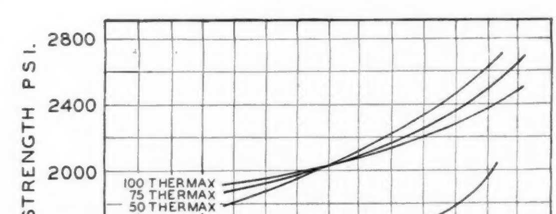


Fig. 2. Tensile strength of carbon black and calcium carbonate-reinforced cross-linked polyethylene *vs.* state of cure for several filler loadings

[2] ASTM D 1238-57T, American Society for Testing Materials, Philadelphia 3, Pa.
[3] ASTM D 1646-57T.
[4] ASTM D 256-56.

cation of heat to form highly reactive free radicals. These free radicals remove hydrogen from the hydrocarbon chain, leaving mutually reactive carbons, and cause cross-linking or curing to form a thermoset material. The number of peroxides, however, which are stable in the temperature range in which low-density polyethylene may be processed, but which will decompose in the temperature range and cure times used by rubber factories is limited. One of these is Varox, a 50% mixture of di-t-butyl peroxy dimethyl hexane and an inert carrier. Normally 4-6 parts of Varox per 100 parts resin are used. The quantity, however, may vary over a broader range, depending on the properties desired or end-use of the product.

The changes in the stress-strain curve with changes in the Varox content under constant cure conditions of time and temperature are shown in Figure 1. The basic compound contained 50 parts Thermax and 0.6-part AgeRite Resin D per 100 parts low-density resin.

The rate of cross-linking is a function of the amount of peroxide and the temperature of cure. The state of cure, then, is controlled by means of these two variables and time.

A convenient method used to determine the relative state of cure is a modification of the Williams plasticity procedure[5] whereby the % compression of a sample is determined at a temperature above the softening point of the thermoplastic polyethylene. In this method, a sample of 0.5-square inch in area and approximately 0.3-inch thick is prepared from four plies of a tensile slab of approximately 0.075-inch thickness. The sample is placed between the platens of a Williams plastometer maintained in a circulating air oven at 250° F. The load applied is 10 kg. The % compression is calculated from the height of the sample at the start of the test and the height of the sample after 30 minutes under load. The compression is compared with a thermoplastic sample which is considered a standard. This standard gives a compression value of approximately 80%.

The modified Williams % compression test for determination of state of cure is illustrated in Table 4. It is apparent that as the cure time is increased, and as the Varox content is increased, the % compression at 250° F. is decreased. This test affords a convenient method of relating properties of the polyethylene to the degree of cross-linking.

Tensile strength may be related to state of cure, as is shown in Figure 2.

The tensile strength[6] is directly related to state of cure in carbon black-loaded stocks when carbon black is used within certain volume loading limits. Medium thermal blacks appear to be uniquely suited as a filler in

TABLE 3. IZOD IMPACT STRENGTH (NOTCHED SAMPLE) vs. MELT INDEX

	0.5 MI	9 MI
High-density polyethylene (0.95)	100.0	100.0
Thermax	50.0	50.0
AgeRite Resin D* (polymerized trimethyldihydroquinoline)	0.5	0.5
Varox	4.0	4.0
Press cure 40′ @ 340° F.		
Ft. lbs./in. width	20.1	4.5

* Registered trade mark of R. T. Vanderbilt Co.

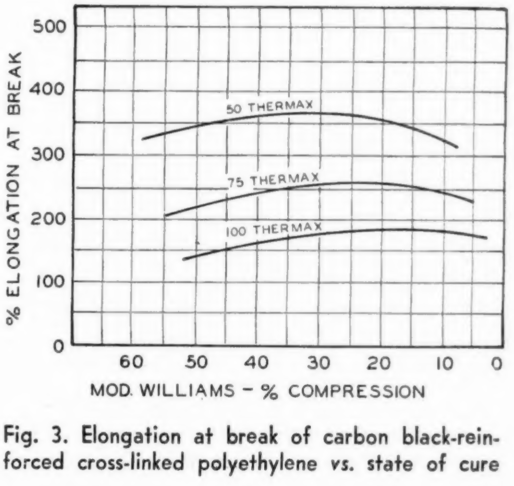


Fig. 3. Elongation at break of carbon black-reinforced cross-linked polyethylene vs. state of cure

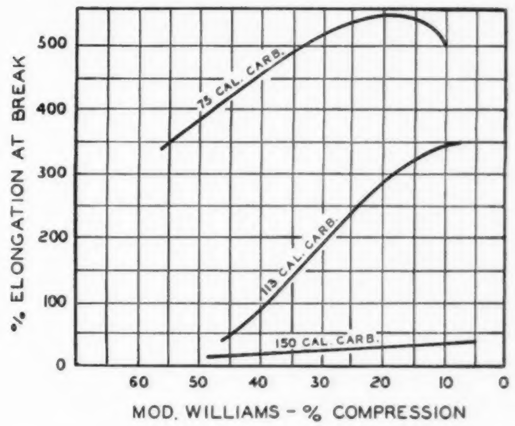


Fig. 4. Elongation at break of calcium carbonate-reinforced cross-linked polyethylene vs. state of cure

TABLE 4. STATE OF CURE BY MODIFIED WILLIAMS TEST

Low-density polyethylene	100.0	100.0
Thermax	100.0	100.0
AgeRite Resin D	0.5	0.5
Varox	4.0	6.0
Press Cure @ 320° F., Min.	% Compression	
10	52.0	33.0
20	33.0	14.0
40	16.0	7.0
80	11.0	3.4
120	8.1	3.0

[5] ASTM D 926-56.
[6] ASTM D 412-51T (at 20 ins./min.).

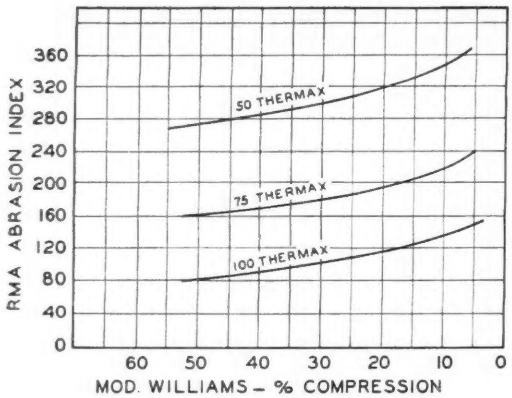


Fig. 5. Abrasion resistance of carbon black-reinforced cross-linked polyethylene vs. state of cure

cross-linked polyethylene because of the properties developed, the high volume loadings which can be used, and the relative low cost of this black. Inorganic fillers which are neutral or slightly alkaline can be used also. Calcium carbonate fillers are commonly used. The loadings of inorganic fillers, however, are limited in that properties fall off rapidly. Acidic fillers have an adverse effect on the cross-linking reaction, and materials such as magnesium oxide are required to neutralize the acidity.

Elongation at break may be related to the state of cure also and is shown in Figure 3. Elongation reaches a maximum at a point between a relatively low and a relatively high degree of cure when the range of carbon black filler of 50 to 100 parts is used. When calcium carbonate[7] is used as a filler, this same phenomenon appears to take place at the low loadings only where a relatively high "stretch-out" is obtained. At high loadings a relatively low elongation and a somewhat brittle compound is obtained. This point is illustrated in Figure 4.

Figure 5 compares abrasion with state of cure for the same three loading levels of Thermax. Abrasion resistance was obtained on a National Bureau of Standards abrader by the RMA procedure[8] using a standard rubber tread compound for comparison. Resistance to abrasion appears to be improved as the state of cure is increased.

Low-temperature brittle point[9] is also related to state of cure. Again we see the advantage in developing a high state of cure, in Figure 6. The low-temperature brittle point is markedly improved by obtaining a high state of cure.

Antioxidants have a definite place in cross-linked polyethylene compounds, particularly if the compounds are subjected to high temperatures. Many of the conventional antioxidants used in the rubber industry, however, retard the cure rate. An example of the results obtained with one of the antioxidants which has a minimum adverse effect on the state of cure is shown in Table 5. This antioxidant, AgeRite Resin D may be used in quantities up to 1 part without a marked adverse effect on the state of cure. Normally 0.5 of a part is sufficient to protect the polyethylene satisfactorily.

Another antioxidant which has a minimum adverse effect on the state of cure and supplies good protection from heat aging is AgeRite White,[10] di beta naphthyl-p-phenylenediamine.

It can be seen that the compound containing the antioxidant is well protected from heat breakdown; whereas the compound without the antioxidant has fused from heat breakdown.

Some work has been done on softening and plasticizing cross-linked polyethylene compounds. Naphthenic and aromatic liquid plasticizers and elastomeric blends may be used in limited quantities without markedly affecting the properties, and some reduction in hardness and stiffness may be obtained. Acrylonitrile-butadiene polymers of low acrylonitrile content have been found to be quite satisfactory among the elastomeric plasticizers.

Processing

Cross-linkable polyethylene may be readily handled in conventional rubber processing equipment. Since the mixing and processing temperature must be above the fluxing temperature of the resin and yet below the temperature at which the peroxide decomposes rapidly, it is necessary that instruments for accurate control of temperature of the equipment be installed. A temperature range of approximately 230 to 300° F. must be maintained.

Most internal mixing equipment has the necessary temperature instrumentation, but may require the addition of means for application of heat, generally by the use of low-pressure steam.

In case the mixer does not have steam heat, preheating the Banbury by means of a hot rubber breakdown followed immediately by the mixing of the poly-

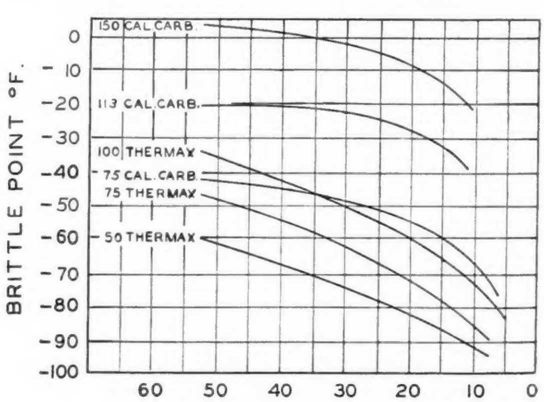


Fig. 6. Brittle point of carbon black and calcium carbonate-reinforced cross-linked polyethylene vs. state of cure at the various filler loadings

[7] Atomite, wet ground calcium carbonate, Thompson, Weinman & Co., New York 17, N. Y.

[8] "RMA Standard Procedure for conducting Abrasion Tests on the Bureau of Standards Abrasion Machine," Rubber Manufacturers Associaion, Inc., New York.

[9] ASTM D 736-54T.

[10] Registered trade mark of R. T. Vanderbilt Co.

ethylene batch is a practical alternative. With full ram pressure the batch is generally brought to fluxing temperatures in a few minutes.

The batch, which normally fluxes at 240-250° F. requires an additional 10 minutes for good dispersion of the fillers. If temperature control is adequate, the peroxide may then be added, followed by further mixing for 3-4 minutes. If temperature control is not adequate, the batch may be dropped prior to the addition of the peroxide, sheeted off, and ground, followed by a second cooler mix during which the peroxide is added. This second mixing, which may last only 3-4 minutes, may also improve the filler dispersion considerably.

The batch may also be mixed on a steamheated rubber mill. A close mill setting is necessary while the stock in the bite of the mill fluxes and starts to band. The mill may then be opened slightly until a larger fluxed bank is formed, when the mill rolls may be opened still further. A mill roll surface temperature of 200-220° F. is desirable. Above this temperature, the stock may go to the fast back roll and stick.

Normally, all ingredients except the peroxide are added in the Banbury. Only the peroxide is held out during the fluxing and dispersing cycle. The peroxide is then added, followed by 3-4 minutes' further mixing.

Polyethylene batches vary in their viscosity during the mixing cycle. The maximum viscosity is reached when the stock is going through the fluxing stage. Above this point, the viscosity drops. The viscosity is also highly dependent on the melt index of the resin, the type of filler, and the quantity of filler. After the peroxide is added, the viscosity will also rise if there is peroxide decomposition in the Banbury.

Table 6 illustrates the difference in viscosity with three different loadings of Thermax and the Mooney scorch at two different levels of Varox. It can be seen that, even at the higher level of Varox, adequate safety for processing at this temperature is afforded.

Following mixing, the next unit of equipment to be considered is the sheet-off mill below the mixer. Mill rolls should be controlled at about 200-220° F., the same temperatures used if the stock is mill mixed initially. If the rolls are too cold, the stock will ride in the bite or will go through and crumble and fall on to the pan. If the mill rolls are too hot, the stock will tend to go to the fast back roll and stick. If the stock does stick, adjustment of the temperature to the proper range will usually release it.

The stock is generally strip fed from the sheet-off mill, through a cooling tank, and ground or diced so it may be fed into extruders or other processing equipment.

The material has been extruded successfully, using both plastic and rubber machines, with a relatively high length to diameter ratio being preferred. Accurate temperature instrumentation and control are necessary. The temperature settings in the various zones of the barrel may vary considerably, depending on the temperature control, type of loading in the stock, and rate of extrusion. The temperature of the stock in the extruder must be in the range of 240-260° F. to bring it above the fluxing temperature which may require extruder settings anywhere in the range of 200-250° F. The extruder head and die temperatures should be in the range of 250-270° F., depending on the stock viscosity and the peroxide used. At times it may be desirable to add cooling water to the screw, although care must be taken to prevent chilling and solidification of the polyethylene around the screw.

Open steam curing in CV equipment has been used in wire insulation. Several continuous methods of curing pipe are being considered including high-pressure open steam, molten metal, and electric induction. Shorter lengths may be mandrel supported and wrapped or lead coated for open steam cures in a vulcanizer.

Mold cured products are in their infancy. In some cases the mold must be cooled in order to obtain an undistorted product. In other cases, where a high state of cure and high filler loadings are used, the product may be removed from a hot mold without undue distortion.

Adhesion of the cured product to the mold has been a problem. Silicones and other release agents used in release of rubber products have been partially successful in solving this problem.

Applications

In addition to the use of cross-linked polyethylene as wire insulation, considerable interest has been shown for cross-linked polyethylene compounds in the flexible

TABLE 5. ANTIOXIDANTS IN CROSS-LINKED POLYETHYLENE

Low-density polyethylene	100.0		100.0	
Thermax	50.0		50.0	
Varox	4.0		4.0	
AgeRite Resin D	—		0.5	

Tensile Strength (T)—Elongation (E)

	Originals			
Press Cures at 320° F., Min.	T, psi.	E, %	T, psi.	E, %
10	1980	360	1750	350
20	2260	340	2080	390
40	2480	320	2280	380
Aged 7 Days in Test Tubes (Air) at 121° C. (250° F.)				
10	Fused		1750	350
20	Fused		2010	370
40	1680	30	2360	360

TABLE 6. MOONEY SCORCH AND VISCOSITY AT 270° F.

Low-density polyethylene	100.0	100.0	100.0
AgeRite Resin D	0.5	0.5	0.5
Thermax	50.0	75.0	100.0
Varox (4) Scorch Time T_5	46.0	48.0	50.0
Viscosity—ML 1 + 4	9.5	11.0	14.0
Varox (6) Scorch Time T_5	37.0	37.0	35.0
Viscosity—ML 1 + 4	9.0	11.0	15.0

Table 7. Typical Pipe Compound

Low-density polyethylene	100.0
Thermax	100.0
AgeRite Resin D	0.5
Varox	4.0

tubing, pipe, and rigid conduit field. This interest has ranged from linings for flexible rubber-covered tubing which would require low filler loading to rigid conduits containing several hundred parts of thermal black. A typical pipe compound is shown in Table 7.

A typical conduit compound which may be considered for drainage pipe is shown in Table 8.

Interest is being shown in the container industry where a heat stable, chemically resistant material, either as a liner or as a complete drum, is desired.

Cross-linked polyethylene could be the raw material for a variety of mechanical goods. Table 9 shows a compound for a tough, semi-rigid article.

One of the unique applications in which considerable interest has been shown is cross-linked polyethylene sponge. Both open-cell and closed-cell sponges have been made by the use of conventional nitrogen blowing agents and cross-linked with peroxides. The molding and forming techniques are very similar to those used in the rubber industry. These materials suggest many applications where heat stability and chemical resistance along with high insulation values are required. Table 10 shows a typical open-cell or closed-cell compound.

Many other commercial applications for cross-linked polyethylene will undoubtedly be developed as the rubber and the plastics industry examines thoroughly the possible uses for this material.

Summary and Conclusions

The properties and processing characteristics of thermoplastic polyethylene are related principally to density and melt index, and the processing and properties of cross-linked polyethylene are also affected by these factors. The low-density resins have the lowest crystallization temperature and are the most readily adapted to processing in rubber equipment. Melt index is an empirical measurement of viscosity and molecular weight.

In spite of a low degree of unsaturation in polyethylene which prevents curing by conventional sulfur-accelerator systems, other types of curing systems such as a use of peroxides may be used to cross-link this material into a very interesting and useful material which can be substituted for conventionally used materials.

Table 8. Drainage Pipe Compound

Low-density polyethylene	100.0
Thermax	300.0
AgeRite Resin D	0.5
Varox	6.0

Table 9. Mechanical Goods Compound

Low-density polyethylene	100.0
Acrylonitrile-butadiene-polymer	25.0
Thermax	50.0
FEF black	15.0
AgeRite Resin D	0.5
Aromatic oil	10.0
Varox	8.0

Cross-linking of polyethylene is best accomplished by organic peroxides such as di-t-butyl peroxy dimethyl hexane which are stable at processing temperatures, but decompose in the temperature range and cure times used in the rubber industry. Low-density polyethylene of high melt index is safer processing than the low melt index material, but the former gives lower physical properties at the same level of peroxide. The rate of cross-linking is a function of the amount of peroxide and the temperature of cure.

Tensile strength, elongation, abrasion resistance and brittle point of cross-linked polyethylene containing medium thermal black are all related to state of cure. Antioxidants of the trimethyl hydroquinoline and beta naphthyl-p-phenylenediamine types are very well suited and necessary in the compounding and processing of cross-linked polyethylene.

In processing, a temperature range of 230 to 300° F. is required in an internal mixer, and the batch normally fluxes at 240 to 250° F. Mixing and sheeting on a two-roll mill require roll surface temperatures of 200-220° F. Extrusion is best accomplished in machines with a relatively high length to diameter ratio; stock temperatures should be in the 240 to 250° F. range, with head and die temperatures between 250 and 270° F., depending on the stock viscosity and the peroxide used.

Open steam curing in CV equipment has been used for wire insulation, and several continuous methods for curing pipe are being considered. With a high state of cure and high filler loading, molded products may be removed without distortion from the mold.

Typical compounds for pipe and conduit, mechanical goods, and blown sponge are given.

Table 10. Sponge Compound

Low-density polyethylene	100.0
Thermax	50.0
AgeRite Resin D	0.5
Urea complex activator*	2.5
Nitrogen blowing agent†	10–15
Varox	4–6

* Aktone, J. M. Huber Corp., New York 17.
†Celogen AZ, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

Novel Barwell Camelback Extruder

Versatile machine, designed for retread extrusions, may be of considerable use for other extrusions as well

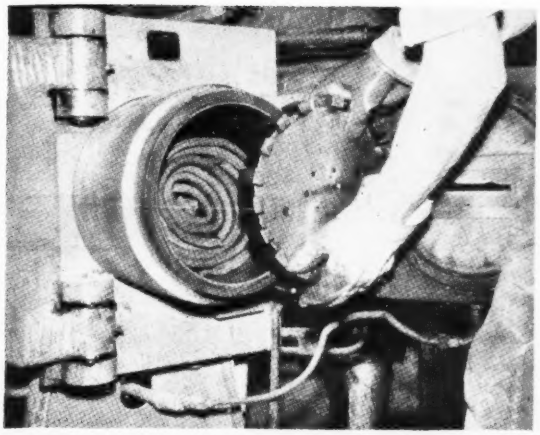


Fig. 1. Operator prepares to insert the "choke" into the barrel of a Barwell extruder in front of the roll of prewarmed rubber compound

MUCH speculation has been done in retreading circles for the past several months about English inventor John Barwell's specially designed hydraulic extruder for use in retreading shops. It is very possible, however, that this piece of equipment may also be of considerable value to extruders of other products. The extruder is a versatile machine which can be used to extrude blanks for mechanical goods moldings, tubes, strips, or other blanks such as shoe soles or heels. It is particularly useful for short runs or quick changes of stock from color to color.

The extruder may be fed compound that has been warmed on a mill, or, as is the case in most retread layouts, the compound may be warmed in a warming chamber. The compound is fed into the extruder as a roll made on a rolling device after warming or taken as a roll from the mill.

The Barwell extruder may be operated at any desired temperature, and it can produce extrusions from 0.004-square inch to 15-square inch cross-sectional area. Cleaning is easy, and it is practical to use compounds of different colors in rapid succession, and as the hydraulic pressure is infinitely variable, it is possible to make very short runs with quick attainment of the dimensional specification. Dies can be changed in 30 seconds.

During a symposium held by the Akron Rubber Group concerning retreading, the panelists suggested, in answer to a question request for an opinion on the Barwell extruder, that there is a great deal of interest in the equipment. It could be used for test tire tread extrusions, small industrial product extrusions, or any other "batch type" extrusions. In retread shops it reduces the inventory of camelback and permits shipping of basic stock without the special packaging now used for camelback. Actual costs and cost savings will depend upon licensing arrangements and the volume of rubber being handled by the extruder.

When this machine is used in a retreading operation, the layout is as follows. Stock is purchased in sheet form and stored wherever convenient. When desired for use, the stock is placed for three to four minutes in the warming chamber which is steamheated. This warmed stock is then put into a roll former and rolled up into a pig for feeding into the extruder; this roll is placed into the barrel of the extruder (see Figure 1), followed by a "choke," and then locked in by the head containing the die. Pressure is delivered by hydraulic rams in the extruder. The extruded camelback of the proper size (see Figure 2) is then run through a cementer into a storage magazine which is portable and can be lined up with a tire building machine for application to the carcass.

One machine in the plant of the inventor, Barwell, has been producing up to 250 retreads a day and has delivered a grand total of about 300,000 retreads in the seven years it has been operating. Another machine operated by Firestone in London produces up to 500 retreads daily.

Distribution rights for the United States and Canada have been granted to Research Enterprises, Inc., Box 397, Manchester, N. H. This company has announced plans to make and license these extruders in these areas. Present plans call for initial production of about two machines per week.

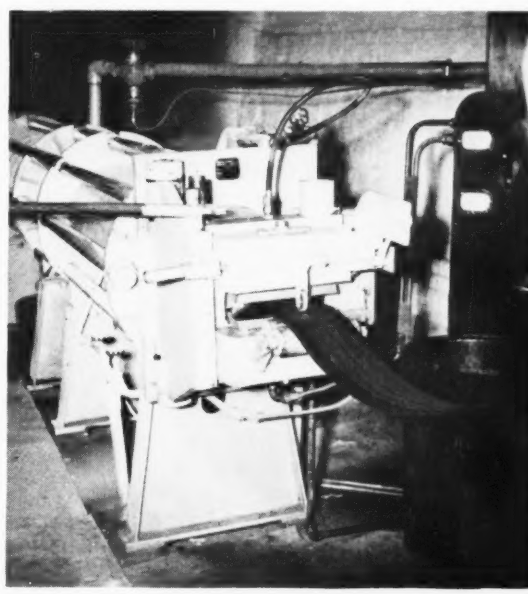


Fig. 2. Camelback being extruded on the spot in a retreading shop from a Barwell hydraulic extruder

New Service Laboratory Opened

THE United Carbon Co., Inc., producer of carbon blacks and SBR-black masterbatches, opened its new service laboratory at 1034 S. High St., Akron, O. (Figure 1), during the last week in April, for inspection by the press and representatives of the rubber industry from the Akron area and elsewhere. Top echelon management of United Carbon including five members of the board of directors headed by S. C. Coleman, chairman, and R. W. French, president, was present for the opening.

In commenting on the new service laboratory, Mr. French pointed out that today's technological advances are occurring at such a rate that a raw material manufacturer must constantly analyze end-product requirements and process improvement to know what will be required of his products tomorrow.

Practical interpretation of data for customer use and for product improvement programs is a major goal of this new facility, according to Morrison M. Bump, executive vice president and director of marketing for the company. Frank O. Holmes, manager of the new laboratory, added that the ultimate goal is to be able to simulate commercial conditions which surround all the uses of United Carbon's products. Once such information is obtained, it is planned to work with the customers' personnel in order to try to help them with their production problems wherever possible.

The laboratory is staffed by United Carbon's long-term carbon black specialists and by a group of newly recruited men with extensive commercial production experience. Plans to expand this group of production specialists to cover all industries utilizing United Carbon's products indicated the broad scope the product and process evaluation programs are to cover.

The new service laboratory is a modern, air conditioned, two-story facility with much of the first or ground floor given over to a processing laboratory where the equipment includes a rubber injection molding machine of the latest design. The general and rubber storage areas, library, boiler room, and the office of the supervisor of the processing laboratory are also located on this floor.

On the second floor are the mixing room, mill and press room, physical testing laboratories, chemical laboratory and other laboratories, and a large conference room. The offices of the manager and the assistant manager of the service laboratory and the field technical service manager are on the second floor.

In view of United Carbon's expressed intent to provide maximum service to customers in connection with their end-products in which United Carbon's materials are used, a detailed description of the equipment in some of the major laboratory rooms in the new service laboratory is considered to be of interest.

The Processing Laboratory

The equipment in this laboratory, a rubber injection molding machine, a four-roll inverted "L" calender, an electrically heated extruder, a two-roll mill, and a Weather-O-Meter.

The Lewis Molding & Engineering Co.'s rubber in-

jection molding machine shown in Figure 2 is a Model RJ8 of 7½-ounce capacity with a die plate size of 12 by 20 inches and a die plate opening of 11¼ inches. Pressure on the material being molded may be as high as 20,000 psi., while the mold clamp pressure is 100 tons. This machine may be used for both thermoplastic and thermoset materials at temperatures up to 400° F. An SBR tread stock in the form of a small household item can be cured in 60 seconds at 400° F., as compared with 40 minutes at 280° F. in a compression molding press. The physical properties of the vulcanizate from the Lewis press are said to be as good or better than those from compression molded items, and the surface finish is very smooth. Products that may be cured in this injection press include brake boots, seats, rings, gaskets, shoe soles, and even men's rubbers.

The Farrel-Birmingham four-roll inverted "L" calender in Figure 3 has 8- by 16-inch rolls, and temperatures from 70 to 500° F. may be obtained on these rolls. It is equipped with forced feed lubrication.

The Blaw-Knox, Aetna Standard Division 1½-inch extruder in Figure 4 has a capacity of 75 pounds per hour. This induction-heated extruder has three zones with separate temperature control in the barrel and head and a separate die temperature control panel to control up to three zones in the die assembly. The overall temperature range is from 70 to 700° F., and either thermoplastic or thermosetting materials may be processed.

The Stewart Bolling 6- by 18-inch two-roll mill has a 1:1.1 friction ratio with rolls operating at about 28 r.p.m. and a temperature range of from 55 to 500° F. It has chrome-plated rolls capable of handling the more corrosive types of elastomers and is equipped with forced feed lubrication.

An Atlas Electric Devices Model XW-R Weather-O-Meter is also installed in the processing laboratory. Weather resistance of stressed and unstressed compounds may be tested in this apparatus under conditions of controlled humidity and simulated rain and artificial sunlight.

Mixing Room

The model B laboratory Banbury mixer shown in Figure 5 is fully instrumented for determining and recording temperature, power used, and d.c. voltage as a check on the speed of the motor drive. Rotor speeds are variable from 20-150 r.p.m., and hot water and steam are used to obtain temperatures up to 338° F. Recorded data on the mixing characteristics of elastomer compounds under conditions closely duplicating those in the factory may thus be obtained.

The Stewart Bolling 6- by 13-inch two-roll mill in the mixing room is used for sheeting out Banbury mixed stocks or incorporating black into masterbatches or finished mixed stocks in this room, which is completely enclosed and separate from other rooms in the area. This mill has a friction ratio of 1:1.4 and a temperature range of 55 to 338° F.

Mill and Press Room

The mill and press room adjoins the mixing room

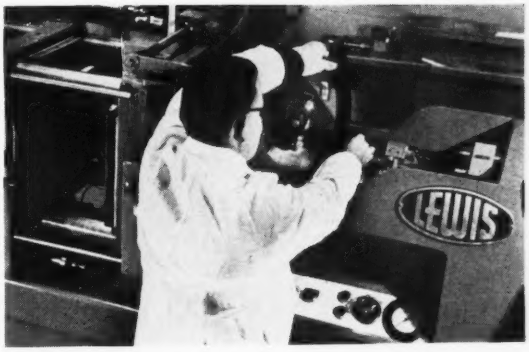


Fig. 2. Lewis injection molding press

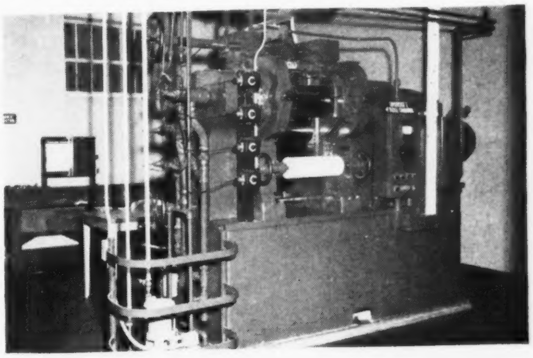


Fig. 3. Four-roll inverted "L" calender

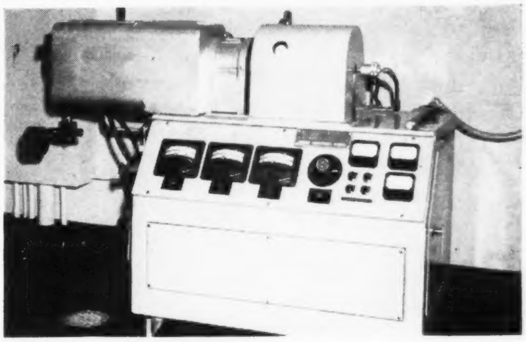


Fig. 4. Electrically heated extruder

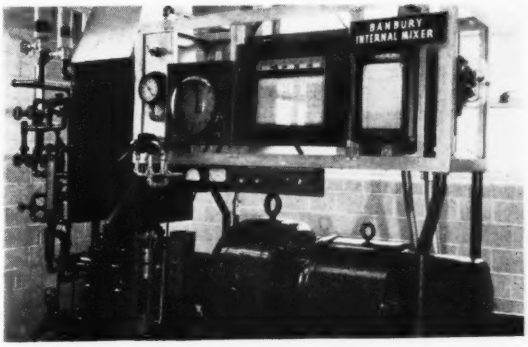


Fig. 5. Instrumented laboratory Banbury mixer

Fig. 6. Loading side of compression presses

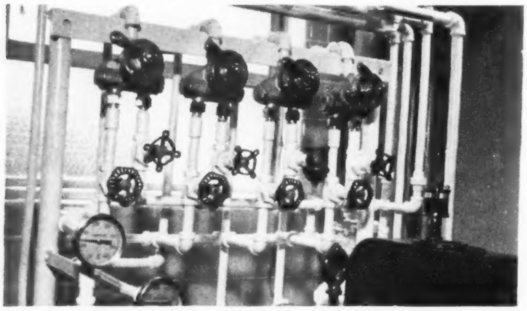


Fig. 7. Steam, hot water, refrigerated water, and city water controls for rubber extruder

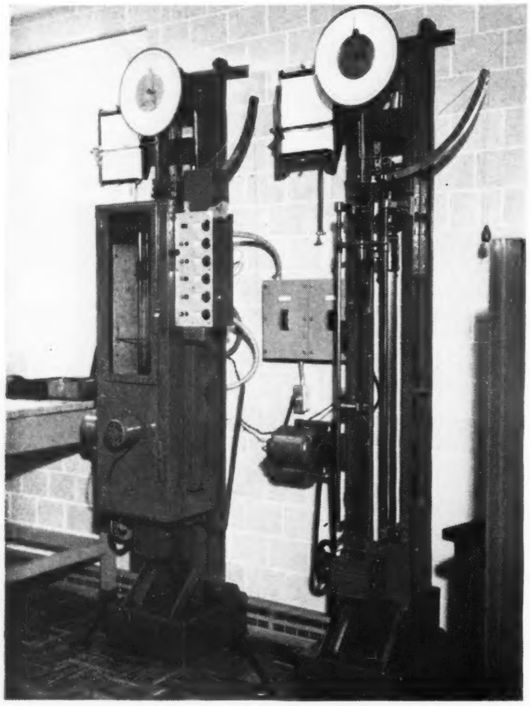


Fig. 8. Tensile and stress-strain testing machines

and the room in which the compounds are weighed out and is itself separated and enclosed from the other rooms in the area. The three compression molding presses and the jacketed vulcanizer are enclosed behind transite board in order to facilitate the removal of the heat involved, as shown in Figure 6.

The National Rubber Machinery 1½-inch extruder has heating and cooling facilities from four sources, as indicated in Figure 7. Hot water and steam are available for heating, and refrigerated water and city water are used for cooling, depending on the season of the year. This extruder has a capacity of 70 pounds per hour and a temperature range from 55 to 338° F. It is used to rate stock for speed of extrusion, die swell, and shrinkage.

The two-roll Stewart Bolling 6- by 18-inch mill has a friction ratio of 1:1.28 with roll speeds of about 26 r.p.m. Temperatures from 55 to 338° may be obtained.

Two of the Adamson United compression presses have 24- by 24-inch platens and operate at pressures up to 2000 psi. and temperatures up to 338° F. One is a two-platen, and the other a four-platen press. The third Stewart Bolling press has two 20- by 20-inch platens and operates at pressures up to 1500 psi. and temperatures up to 338° F. All of these presses have individual pressure and recorded temperature controls and operate with a temperature variation of not more than 1° F., using timed blowdown rather than the conventional steam traps.

The Stewart Bolling jacketed vulcanizer is 20 inches in diameter and 36 inches long and may be used at temperatures up to 338° F.

Physical Testing Laboratories

The physical testing laboratories are separated into a room for tensile and stress-strain testing, which is controlled for temperature as well as humidity, a physical testing room which includes equipment other than that for stress-strain testing, and a room containing the ovens and other apparatus for accelerated aging.

The tensile testing room contains two Model L8 Scott Testers machines, one of which is equipped for measurements up to 300° F., as shown in Figure 8. A CRE fully automatic stress-strain testing machine, also by Scott Testers, is another of the most modern pieces of equipment available in this room. The electrical weighing system on the CRE machine is of the highest order of accuracy and sensitivity, and a permanent record of stress-strain data is obtained.

The Model STI Mooney viscometer of Scott Testers in the physical testing room is fully automatic in operation in that the dies are closed by air pressure and the instrumentation provides means for recording temperatures and viscosity data. (See Figure 9.)

Both the Goodrich and the Firestone flexometers are available for the dynamic testing of rubber stocks. The Goodrich machine flexes the specimen 1,800 times per minute under a 50-pound load and measures the heat build-up in the rubber in the center of the base of the specimen. The Firestone machine flexes the specimen

Fig. 9. Automatic Mooney viscometer

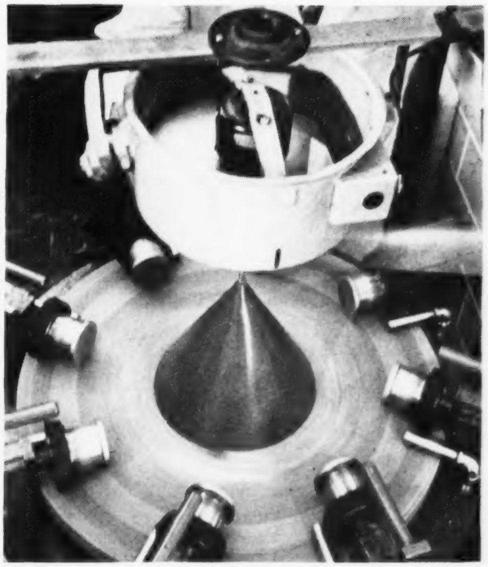


Fig. 10. Goodyear angle abrader

800 times per minute under a load from 250 to 500 pounds to evaluate the resistance to blowout, while heat build-up data can be obtained at the same time.

Also available are a DeMattia flex cracking machine which operates at 375 cycles per minute on a specimen which has a molded-in groove at the center and an initiated crack, and a Ross flexing machine which operates at 100 flexes per minute on a specimen bent to an angle of 90 degrees and also measures the growth of an initiated crack.

The Firestone plastometer is used for determining the extrudability or processability of rubber stocks.

The Goodyear angle abrader shown in Figure 10 uses a 3½-inch-diameter specimen set 11 degrees ahead of center on a revolving grinding stone, and after 32 minutes at 85 r.p.m. under a 32-pound load the total volume loss is used to estimate tire tread wear.

Oven and Age Room

The equipment in this room includes the oxygen bomb, air ovens, and an ozone test chamber, test tube-type aging apparatus, and a Fade-O-Meter for simulated service testing.

The Mast Model 700-1 ozone test chamber provides controlled ozone concentration and facilities for testing samples under the static of dynamic flex conditions.

The Scott Testers Model LG aging cell has a capacity for 48 samples contained in test tubes mounted in a heated aluminum block with a temperature range from 70 to 300° F. available for such testing.

The Atlas Electric Devices Model FD-R Fade-O-Meter is a high humidity carbon arc exposure chamber for checking crazing and chalking of rubber stock and the fading of colored goods.

Danger in Misusing Compressed Air Hoses Stressed

Compressed air should never, at any time, be applied to any part of the body, according to the *Safety Newsletter* of the Rubber Section, National Safety Council.

In one instance, a man received a slight scratch on his wrist. The injury did not draw blood, and, as his arm was dusty, the man picked up an air hose to blow off the dust for a better view of the injury. Air entered the tissue of his arm and puffed up his entire forearm. He was disabled for several weeks.

In another case, a worker died from internal injuries resulting from a fellow employe placing a compressed air hose against his rectum and turning on the air. The *Newsletter* notes, and rightly so, that to be guilty of using an air hose in such "horse play" is disgraceful.

There are many uses for compressed air and open air hoses in rubber product production, and each air hose is a potential instrument of death. No person should use this equipment for any reason whatsoever unless he has been instructed in its use, and unless he is authorized to use it. Safety bulletins repeatedly give warning of air hose dangers, and they should always be heeded to prevent such injuries or fatalities.

The Chemistry of Vulcanization of "Viton" A Fluorocarbon Elastomer[1]

J. F. Smith

Cross-linking shown to be a three-stage process

By J. F. SMITH

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

THE "Viton" fluorocarbon elastomers are copolymers of hexafluoropropylene and vinylidene fluoride designed for use where resistance to high temperatures and to solvents is important. The formula of "Viton" A is shown below:

$$\left[(CH_2CF_2)_nCF_2\overset{\displaystyle CF_3}{\overset{|}{C}}F \right]_x$$

I

Practical methods of vulcanization of the raw polymer depend almost exclusively on the reaction of strongly basic amines with the polyvinylidene fluoride segments of the chain in which alternating methylene and difluoromethylene groups provide sides for HF elimination. This article describes some commonly used curing systems and outlines the evidence on which a mechanism for their action may be based.

Curing Agents

Diamines

Aliphatic amines, which were the first curing agents used, were extremely scorchy and difficult to use. This deficiency was reduced by using diamines in the form of their inner carbamates. Hexamethylenediamine and ethylenediamine carbamates both had commercial acceptance; the latter is much the less scorchy of the two. An additional class of delayed-action curing agents which was developed to overcome the scorch problem is represented by the Schiff's bases of aliphatic diamines. These are delayed-action curing agents which can vary in speed of curing and lack of scorch all the way from bis-cinnamylidene hexamethylenediamine (II, Table 1; R = cinnamal), which is faster acting than ethylenediamine carbamate, to bis-salicyalpropylene diamine (III, Table 1), which is very slow to cure, indeed, and presents no scorching problem whatever. Table 1 lists the scorch times of a number of diimines and shows their relation to diimine basicity.

An interesting facet of the action of these diimines is that they can be formed *in situ*, as demonstrated by the use of III with hexamethylenediamine carbamate. Metathesis between the two in the polymer gives a mixture of propylenediamine and disalicylalhexamethylenediamine (II, R = o-OH-C_6H_4), neither of which is scorchy. This is the reasoning behind the use of hexamethylenediamine carbamate and "Copper Inhibitor" 65[2] (III) as a non-scorchy formulation.[3]

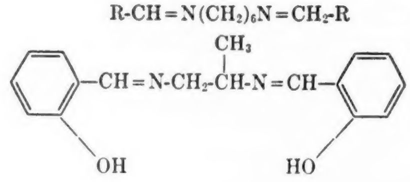
Monoamines

In addition to difunctional curing agents discussed above, strongly basic primary, secondary, and tertiary monoamines will all form cross-links in "Viton," albeit they require rather high (up to 200° C.) press temperatures to obtain successful cures when used alone. Further, monoamines, and particularly monotertiary amines, are potent cocuring agents for diamines,

TABLE 1. EFFECT OF BASICITY OF DIIMINES ON SCORCH TIME

Diimine	Mooney Scorch at 250° F.* Min. to 10-Pt. Rise	Mooney Scorch at 250° F.* Minimum	Neutralization Potential in Chloroform (—MV)
II, R = p-Methoxybenzyl	19	12	300
II, R = o-Methoxybenzyl	24	19	328
II, R = cinnamal	21	10	330
II, R = salicylal	>45	12	395
III	>45	4	450

$$R\text{-}CH{=}N(CH_2)_6N{=}CH_2\text{-}R \qquad (II)$$



(III)

* Compound recipe: "Viton" A, 100; MT Black, 18; MgO, 15; Curing agent, 2.

[1] Based on a paper presented before the International Rubber Conference, Washington, D. C., Nov. 13, 1959.

[2] Du Pont elastomer chemicals department, Wilmington 98.

[3] A. L. Moran, R. P. Kane, J. F. Smith, *Ind. Eng. Chem.*, 51, 831 (1959).

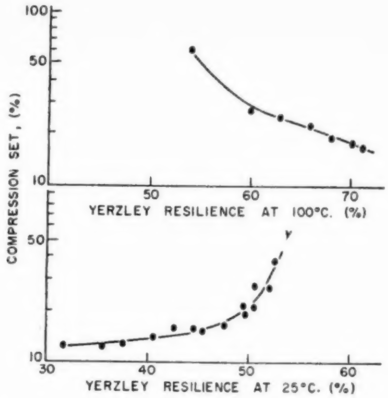


Fig. 1. Relation of Yerzley resilience at 25 and 100° C. to state of cure of "Viton" A

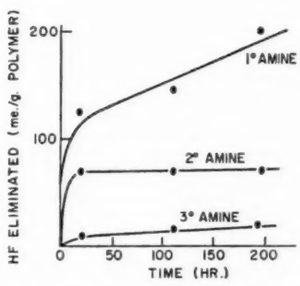


Fig. 2. Rate of elimination of HF from "Viton" A by the action of primary, secondary, and tertiary amines

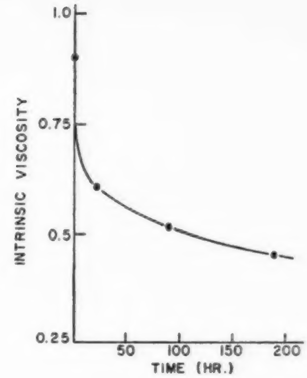


Fig. 3. Effect of treatment with trimethylamine on the intrinsic viscosity of "Viton" A

leading to greatly enhanced cure states at the same diamine level (Table 2).

Just as blocking groups can be used with diamines to reduce the rate of scorch, so can monoamines be used in a combined form that releases free amine at curing temperatures. Thus many of the well-known amine-based rubber accelerators, such as thiuram disulfides and dithiocarbamate esters and salts, can be used to give good "Viton" cures. These materials are, however, very slow to cure.

Dithiols and Tertiary Amines

Another example of the cocuring action of tertiary amines is their effectiveness in combination with dithiols. Dithiols will not, of course, cross-link "Viton" when used alone. In combination with tertiary amines, however, well-cured vulcanizates can be formulated by their use.[4]

The presumption is clear that certainly tertiary amines, and probably also primary and secondary monoamines, act to provide cure sites upon which difunctional curing agents can form cross-links and which can, indeed, cross-link by mutual reaction between neighboring chains. The remainder of this paper is a discussion of evidence concerning the detailed mechanism by which such cross-links are formed.

TABLE 2. COCURING ACTION OF TERTIARY AMINES WITH HEXAMETHYLENEDIAMINE CARBAMATE*

	A	B	C	D	E
"Diak" No. 1†	1.0	1.0	0.5	0.5	0.25
Dimethyldodecylamine	0.0	0.1	0.25	0.5	0.5
Mooney scorch (min. to 20-pt. rise)	13	19	20	10	25
Original properties (Press cure 60 min. at 150° C.; oven cure 18 hrs. at 204° C.)					
Tensile strength, psi.	1900	2000	2260	2250	2250
Elongation, %	230	190	240	200	250
Modulus at 100%	430	650	400	700	330
Compression set, %	31	16	24	15	27
Hardness	70	70	67	70	65

* Hexamethylenediamine carbamate, E. I. du Pont de Nemours & Co., Inc.
† Compound recipe: "Viton" A, 100; MT Black, 18; MgO, 15; curing agents, as given.

Possible Cross-Linking Mechanisms

Because it can be shown that the lower the percentage of vinylidene fluoride in the polymer, the more difficult it is to cross-link, the cure site would at first sight seem to be the alternation of CH_2 and CF_2 groups present in the polyvinylidene fluoride segments of the polymer. It has been proposed many times that cross-links are formed by substitution of the amino groups in a diamine curing agent by means of these fluoride atoms. A preliminary elimination of hydrogen fluoride from a neighboring pair of carbon atoms has also been proposed, activating the fluorine reaction. It has also been realized that if such dehydrofluorination occurred, the fluorinated double bond so formed would be susceptible to addition of amine groups across it.[5]

Several facts militate against this simple view of the curing reaction. In particular, "Viton" A is unusual among elastomers in that its resilience at room temperature decreases with increased state of cure, as measured by compression set or modulus at fixed extension. At 100° C. this tendency is reversed, giving the more usual increase of resilience with increased state of cure. These facts are illustrated by the data in Figure 1 where Yerzeley resilience[6] is plotted against compression set.

Such behavior is not typical of an elastomer which is cross-linked by simple combination of a bifunctional curing agent across adjacent chains. It might be expected, however, of a polymer network which was formed by a process of concurrent cross-linking and

[4] J. F. Smith, RUBBER WORLD, 140, 263 (1959).
[5] S. Dixon, D. R. Rexford, J. S. Rugg, *Ind. Eng. Chem.*, 49, 1687 (1957).
[6] ASTM D 945-55, American Society for Testing Materials, Philadelphia 3, Pa.

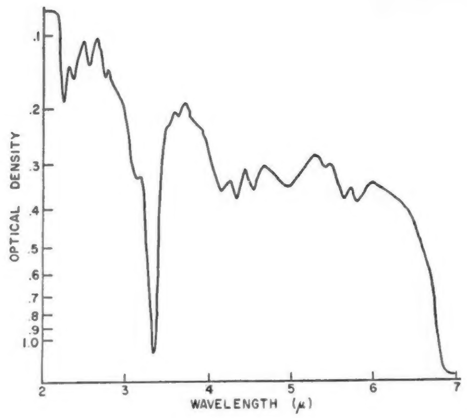


Fig. 4. Infrared absorption spectrum of untreated "Viton" A

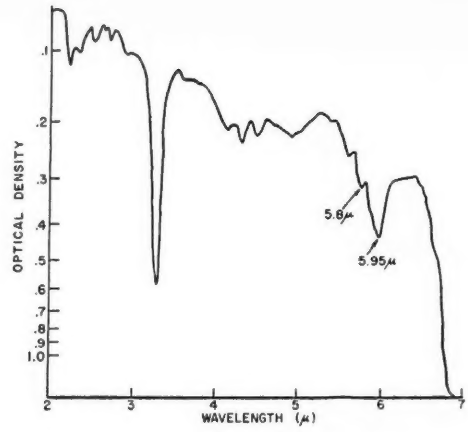


Fig. 5. Spectrum of "Viton" A treated with trimethylamine for eight days

chain scission, especially if we assume that the degree of chain scission increased with increased state of cure; it is a feature of networks made up of highly cross-linked short chains that they are low in resilience and high in hardness, owing presumably to the increase of inactive chain ends in the network in such a system.

HF Elimination

The cross-linking of fluoroelastomers with amines is obviously, then, not a simple process. In order to understand the chemistry of the reaction more fully, we undertook to study the action of amines on "Viton" in solution. Solutions of "Viton" in tetrahydrofuran were treated with primary, secondary, and tertiary amines for periods of several weeks at room temperature. The reaction was followed by the measurement of hydrogen fluoride elimination, by observations of the change in intrinsic viscosity,[7] by nitrogen analyses on the isolated polymer, and by infrared studies.

Figure 2 is a summary of the data referring to hydrogen fluoride elimination. All of the amines used caused dehydrofluorination of the polymer to some degree; tertiary amines were the least, primary amines by far the most active. These experiments confirmed the previously held belief that a feature of the amine curing reactions of "Viton" A was the elimination of hydrogen fluoride. This hydrogen fluoride could not have come entirely from substitution of the amine because it occurred with tertiary as well as with primary and secondary amines.

In addition to dehydrofluorination, chain scission occurs by the action of tertiary amines. The reduction in molecular weight which causes this action can be followed by measuring the viscosity of solutions of the treated polymers in a mixture of tetrahydrofuran and dimethyl formamide.

Figure 3 is a plot of intrinsic viscosity of tertiary amine-treated "Viton" A against time of reaction. The reduction in molecular weight during the reaction is directly related to the reduction in intrinsic viscosity shown in Figure 3.

It is probable that similar degradation occurred in the case of primary and secondary amines, but this could not be demonstrated because of the strong tendency toward gel formation experienced during isolation of the polymer samples. Gross degradation certainly occurred when "Viton" was treated with large excesses of primary and secondary amines.

Double-Bond Formation

The above experiments offered strong presumptive evidence that the formation of double bonds through dehydrofluorination occurs by reaction of amines with "Viton" A. Moreover, because of the tendency of amine-treated polymer to gel, it was clear that the unsaturated polymer could cross-link directly, presumably through reaction at double bonds formed by elimination of HF.

We then attempted to establish the existence of double bonds in amine-treated "Viton" by chemical means. All such direct attempts failed, however. Ozonolysis of amine-treated polymer in acetic acid solution with 6% ozone in oxygen caused no reduction in molecular weight. Double-bond reagents such as permanganate and chlorine or bromine could not be used in tests diagnostic of double bonds because untreated "Viton" was attacked by them in solution.

We therefore turned to infrared spectroscopy as a means of studying the nature of the change in amine-treated "Viton." The following figures show the infrared absorption spectra of pressed films of "Viton" between 2 and 7 microns. Figure 4 is the spectrum of untreated "Viton" A. Figure 5 shows the spectrum of "Viton" after treatment for eight days in tetrahydrofuran solution with trimethylamine. Two clearly marked new absorption peaks developed at 5.8 and 5.95 microns. That the peak was in fact due to the action of the amine is shown by Figure 6, which plots the height of the peak at 5.95 microns against time of reaction in the case of trimethylamine. These peaks

[7] "Principles of Polymer Chemistry," Paul J. Flory, p. 308. Cornell University Press, Ithaca (1953).

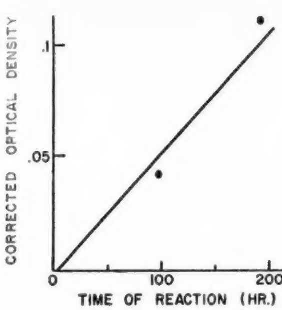


Fig. 6. Effect of time of reaction with trimethylamine on absorption of "Viton" A at 5.95 microns

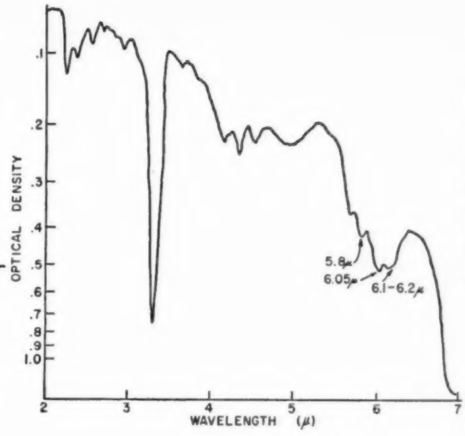


Fig. 7. Spectrum of "Viton" A irradiated at 2 m.e.v. under nitrogen

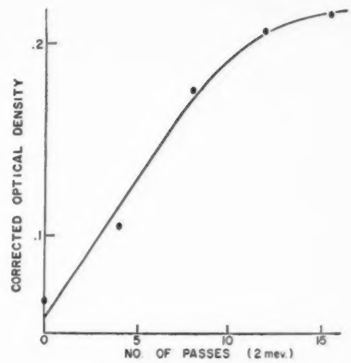


Fig. 8. Effect of irradiation on the intensity of absorption of "Viton" A at 5.8 microns

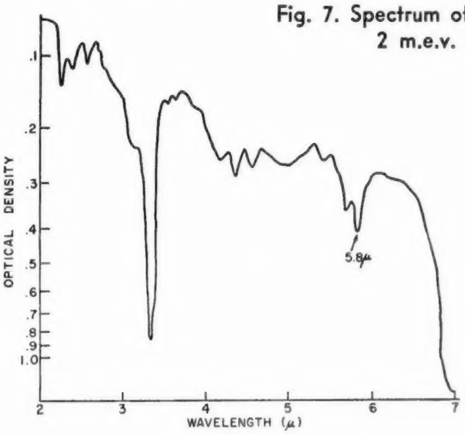


Fig. 9. Spectrum of "Viton" A which was irradiated and heated overnight at 200° C.

were in the region which would be assigned to double bonds. Similar, but more pronounced changes were observed in the spectra of "Viton" after treatment with primary and secondary amines.

Aromatic Ring Formation

High energy radiation can be used to cross-link "Viton" A. The process is accompanied by evolution of hydrogen fluoride. Figure 7 is a spectrum from 2 to 7 microns of "Viton" A which has been irradiated in nitrogen in a Van der Graaff generator at two million electron volts (2 m.e.v.). Precautions were taken to remove dissolved oxygen as completely as possible, to avoid the incorporation of functional groups in the chain. An absorption peak at 5.8 micron appeared; the intensity of absorption increased with the radiation dose (Figure 8). The peak was very similar to the 5.8-micron peak developed by treatment with amine.

It is a feature of radiation cures of "Viton" A that, although a degree of cross-linking is achieved during irradiation, maximum physical properties are not developed unless the polymer is subsequently subjected to a high-temperature post-curing cycle. The reason for this is clearly brought out by the spectrum in Figure 9, which was taken on a sample of "Viton" irradiated in nitrogen and subsequently heated in nitrogen for 24 hours at 200° C. Two strong new absorption bands appeared during this post-curing cycle, at 6.05 and 6.1-6.2 microns.

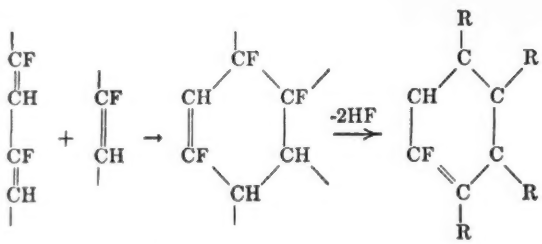
It is proposed that the initially formed double bonds (5.8μ) activate elimination of hydrogen fluoride from neighboring atoms, leading to conjugated double bonds ($6\text{-}6.05\mu$) in the manner demonstrated for polyvinylidene chloride by Boyer.[8] This process would lead to the formation of color, always in evidence after amine-treatment of "Viton." Such a conjugated center would then be expected to react with a double bond in an adjacent chain by a Diels-Alder reaction leading to a fluorinated cyclohexene (IV) which should readily lose hydrogen fluoride to form an aromatic ring (V, R = polymer chain) as shown in Figure 10.

The observed absorption between 6.05-6.2 could be ascribed to such aromatic centers.

In order to provide additional evidence for the existence of aromatic rings, a sample of "Viton" A was strongly irradiated in the Van der Graaff generator (40 passes, 2 m.e.v.), post-cured (20 hours at 200° C.), swollen in acetone, and examined by nuclear magnetic resonance[9] at 40 megacycles/sec. The spectrum was similar to that of untreated "Viton" A except for a new chemical shift at +635 cycles/sec. (relative to trifluoroacetic acid) close to that observed in aromatic fluorides. Pyrolysis of the sample at 400° C. led to evolution of an unresolvable mixture of gases which could not be identified in the mass spectrograph. There is thus some evidence for the existence of aromatic cross-links in cured "Viton" A.

Although the cross-links in "Viton" A are formed by heat-catalyzed dehydrofluorination, this process is one which clearly reaches an end after some hours at 200° C., leading to a vulcanizate which is stable almost indefinitely at this temperature. The formation of

[8] *J. Phys. Chem.*, 51, 80 (1947).
[9] R. C. Ferguson, to be published in *J. Am. Chem. Soc.*



(IV) (V)

Fig. 10. Diels-Alder reaction during post-curing forms aromatic ring with loss of HF

stable benzenoid cross-links would explain this very useful phenomenon.

Theory of Amine, MgO, and Peroxide Actions

Primary, secondary, and tertiary amines and high energy radiation, therefore, have all been shown to react with "Viton" to form double bonds which themselves undergo cross-linking reactions at high temperatures. It is proposed that this is the process by which the oven cure of "Viton" proceeds, whatever actual curing system is used. It is a process requiring a high temperature (200° C.) and a relatively long time (about 10-20 hours). In the case of monoamine cures it is essentially the only cross-linking reaction which takes place, and these systems are, therefore, slow curing, requiring high press temperatures to prevent sponging in thicker sectioned articles.

In systems where difunctional curing agents are involved, such as diamines or dithiols, other cross-links are formed at lower temperatures by reaction of the functional groups of the curing agent at the double bonds formed by the action of bases. This cross-linking reaction takes place during the press cure (150° C.) commonly recommended for "Viton" A. Its exact nature has been difficult to determine. Addition across the double bonds and substitution of fluorine atoms are both possibilities.

Whatever the detailed nature of the reaction between functional groups and cure sites, the net result is the same. Cross-links are formed involving difunctional reagents at lower temperatures than are required for the direct reaction between chains. This is why formulations containing difunctional agents such as diamines, diimines, or dithiols require lower press temperatures and are faster curing than monoamines alone and are featured in all commercial "Viton" curing recipes.

The role of acid acceptors in the curing formulation is not easy to understand. "Viton" cannot be cross-linked to an effective state of cure by any known curing agent unless there is included in the curing formula an acid acceptor like magnesium oxide, zinc oxide, basic lead phosphite, or some such ingredient. This is true of peroxide cures, radiation cures, and all known amine-type cures. Dithiol cures are especially specific, requiring magnesium oxide for cure, although magnesium oxide itself effects no cure of "Viton." Infrared spectra of "Viton" containing small amounts of magnesium oxide have been studied in an attempt to understand its importance to the cure. Cross-linking by high energy radiation was used as being the simplest method, introducing least complications.

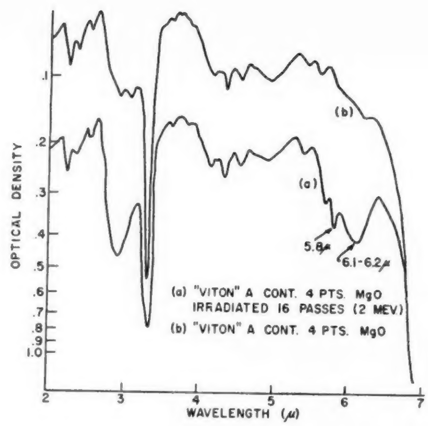


Fig. 11. Spectra of "Viton" A containing magnesium oxide after irradiation (a) compared with uncured stock containing MgO

Figure 11 (a) shows the spectrum of "Viton" A containing 4 parts of magnesium oxide, irradiated 16 passes at 2 m.e.v. The peak at 6.1-6.2μ, normally only observed after an oven aging cycle in irradiated "Viton," appeared immediately on irradiation, demonstrating the effect of magnesium oxide in promoting the formation of conjugated cross-link sites. Figure 11 (b) is a spectrum of uncured "Viton" A compounded with MgO, given for comparison.

The method of action of peroxides as "Viton" curing agents was difficult to study both spectroscopically, because of interference from compounding ingredients, and chemically, because of the rapid onset of gelation. It is believed, however, that peroxides behave similarly to radiation and involve the elimination of hydrogen fluoride to form unsaturated cross-linking sites in addition to the formation of direct cross-links through free radicals or adjacent chains. Some spectral and chemical evidence exists for this viewpoint, in addition to the fact that, as in all other "Viton" curing systems, acid acceptors are necessary to peroxide cures.

Summary and Conclusions

In summary, the cross-linking of "Viton" A takes place by a three-stage process. Bases, high energy radiation, and other radical generators, in conjunction with metal oxides, react with the "Viton" chain at the polyvinylidene fluoride segments to form double bonds. This process occurs at room temperature and somewhat above. During press cures at or about 150° C. difunctional cross-linking agents such as diamines or dithiols react with these double bonds to form partially cross-linked stocks. During the oven post-curing cycle at 200° C., conjugated double-bond systems are formed by dehydrofluorination at points adjacent to the double

bonds formed in the first stage. These unsaturated centers then react to form additional heat stable cross-links. This vulcanizate is largely stable to heat; the centers of instability have been removed by the oven cure.

Amine cures of "Viton" thus represent the best available method of processing the polymer to a vulcanizate which is stable both to high temperatures and to chemical attack and has the best obtainable physical properties. The amine derivatives such as carbamates and diimines confer additional advantage of processability and are thus to be preferred.

EXPERIMENTAL DETAILS

Infrared absorption spectra were determined in a Perkin Elmer Model 21 double-beam recording infrared spectrophotometer using a sodium chloride prism. Pressed films were used where possible to avoid contamination with solvent.

"Viton" compounds were prepared in conventional rubber processing equipment and tested by standard ASTM procedures.

Reaction of "Viton" A with Amines in Solution

In a typical experiment, 50 g. of "Viton" A was dissolved by roller milling in 500 ml. tetrahydrofuran, and treated with 10 g. trimethylamine. Immediately after mixing, 50 ml. were removed, diluted with water, and the precipitated polymer filtered off and washed with water. The filtrate and washings were combined, diluted to 250 ml. with water, and analyzed for fluoride ion. This sample was used as a blank to insure that the isolation techniques were efficient. During the next eight days 50 ml. aliquot portions were removed at intervals and treated similarly. The results discussed above were obtained on such samples.

Irradiation[10] of "Viton" A

"Viton" A films (thickness approximately 0.005-inch) were supported on metal rings. Each ring was placed into a pyrex glass tube which was then evacuated and pumped for seven days at 10^{-5} mm. The tube was filled with nitrogen and sealed. It was then irradiated by passing the tube at a distance of 10 cm. under the aluminum window of a vertical Van der Graaff electrostatic generator operating at 2,000,000 electron volts, 250 microamperes. Each pass exposed the sample to 11 watt seconds of energy. The number of passes employed in each case is indicated in the appropriate figures above.

[10] This work was carried out by R. D. Souffie, of the Du Pont elastomer chemicals department.

CALENDAR of COMING EVENTS

June 13-September 2
Gordon Research Conferences. Colby Junior College, New London, N. H.; New Hampton School, New Hampton, N. H.; Kimball Union Academy, Meriden, N. H.

June 20-22
Molded, Extruded, Lathe Cut, and Sponge Rubber Products Subdivision, The Rubber Manufacturers Association, Inc. Annual Meeting. Skytop Lodge, Skytop, Pa.

June 24
Detroit Rubber & Plastics Group, Inc. Outing. Western Country Club.

June 26-July 1
American Society for Testing Materials. Annual Meeting and Subcommittee Meetings. Atlantic City, N. J.

July 22
Chicago Rubber Group. Golf Outing.

August 2
New York Rubber Group. Golf Tourney. Forsgate Country Club, Jamesburg, N. J.

August 19
Philadelphia Rubber Group. Annual Outing. Manufacturer's Country Club, Oreland, Pa.

September 6-16
Production Engineering Show. Navy Pier, Chicago, Ill.

September 8-9
Chemical Institute of Canada and National Research Council. Tenth Canadian High Polymer Forum. Alpine Inn, Ste. Marguerite, P.Q., Canada.

September 10
Northern California Rubber Group. Outing.
Connecticut Rubber Group. Outing.

September 11-16
American Chemical Society. New York, N. Y.

September 13-16
Division of Rubber Chemistry, ACS. Hotel Commodore, New York.

September 26-30
Instrument Society of America. Annual Meeting and Fall Instrument-Automation Conference and Exhibit. Coliseum, New York, N. Y.

September 29
Southern Ohio Rubber Group. Engineers Club, Dayton, O.

September 30
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

October 4
The Los Angeles Rubber Group, Inc.

October 7
The Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.
Chicago Rubber Group.

October 7-8
Southern Rubber Group. Roosevelt Hotel, New Orleans, La.

October 9-11
Rubber & Plastics Division and Erie Section, American Society of Mechanical Engineers. National Conference of Rubber and Plastics Engineers. Hotel Lawrence, Erie, Pa.

October 12-23
Automobile Manufacturers Association. 1960 National Automobile Show. Cobo Hall, Detroit, Mich.

October 13
Northern California Rubber Group. Past Presidents' Night.

October 14
Boston Rubber Group. Hotel Somerset, Boston, Mass.

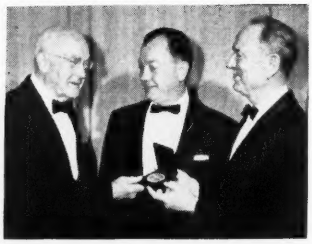
October 17
Elastomer & Plastics Group, Northeastern Section, American Chemical Society. Annual Meeting. Science Park, Boston, Mass.

October 17-21
National Safety Council. Forty-Eighth Annual National Safety Congress. Chicago, Ill.

October 21
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

(Continued on page 153)

MEETINGS and REPORTS



Rubber Division, ACS

Special Lectures, Goodyear Medal Award Highlight Spring Meeting in Buffalo

The Division of Rubber Chemistry of the American Chemical Society held its seventy-seventh meeting in Buffalo, N. Y., May 4-6, at the Statler Hilton Hotel. Registration was 835, including about 60 wives of the members and guests present.

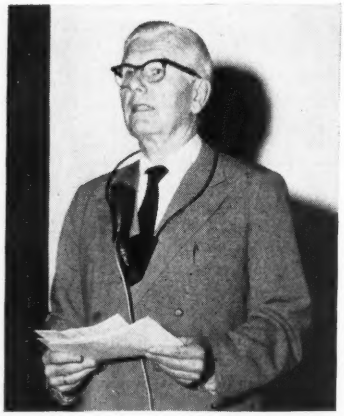
This meeting was featured by contributed papers by Herman F. Mark, Brooklyn Polytechnic Institute, and Peter J. Debye, Cornell University, and the Charles Goodyear Medal Award Lecture by W. B. Wiegand, retired vice president of Columbian Carbon Co. There were four technical sessions at which 16 regular papers were presented on recent developments in rubber chemistry and technology. Abstracts of these papers appeared in our April issue.

There were the usual meeting of the Division's 25-Year Club, the Division banquet at which the Goodyear Medal was awarded to Mr. Wiegand, the suppliers' cocktail party, and a special program for the ladies attending the meeting.

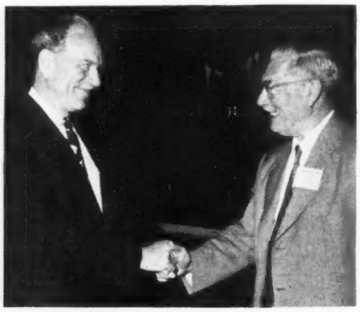
The 1960 Division chairman, W. J. Sparks, Esso Research & Engineering Co., presided at the opening session on the afternoon of May 4, and at the Division banquet. The secretary of the Division, R. H. Gerke, United States Rubber Co., was unable to attend because of illness, and Dr. Sparks was assisted by L. H. Howland, Naugatuck Chemical Division, U. S. Rubber Co., the assistant secretary.

The chairman of the local committee on arrangements was L. J. Halpin, Dunlop Tire & Rubber Co., and E. J. Haas of the same company, was co-chairman. Dr. Sparks expressed his appreciation on several occasions to the chairmen, subcommittee chairmen, and members of the local committee on behalf of the officers, directors, and members of the Division for the very fine work of the local committee that made the Buffalo meeting such a successful affair.

It was announced that the Division's executive committee had authorized a charter flight sponsored by the Division to Europe in October for those members interested in attending the meeting of the German Rubber Society in West Berlin, October 4-7, and the International Synthetic Rubber Symposium and Exhibition, sponsored by Rubber and Plastics Age, in London, October 11-13. A detailed announcement and application form will be mailed to the membership of the Division. Final decision on the flight will depend on the number of applications received, and if one or more 85-passenger planes can be filled, the round trip fare will be only slightly greater than $200 per person.



Professor Mark lectures on chemistry of polymers at Division meeting



Dr. Sparks, *left*, welcomes Professor Debye for his "invited" lecture on physics of polymers

The next meeting of the Division will be held in New York at the Commodore Hotel, September 14-16, in conjunction with the fall meeting of the parent Society. Dr. Sparks has arranged with Prof. C. S. Marvel, of the University of Illinois, to lead off one of the technical sessions with a paper on "Recent Developments in High-Temperature Rubbers," and with Prof. Maurice Morton, of the University of Akron, to lead off another session with a paper on "Recent Developments in Anionic Polymerization."

25-Year Club Meeting

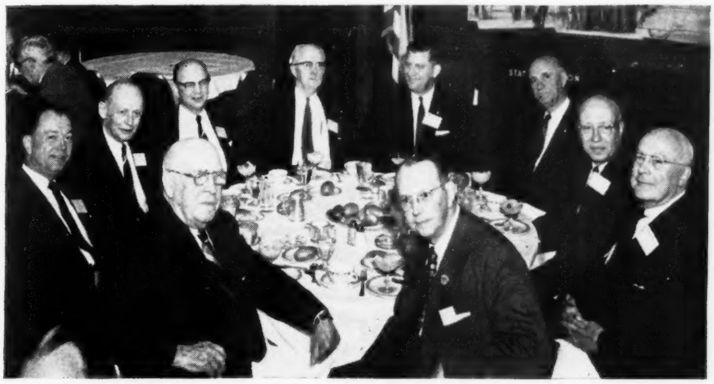
The twenty-fifth meeting of the Division's 25-Year Club was held on May 4, with C. H. Peterson, U. S. Rubber Reclaiming Co., presiding. This luncheon-meeting was preceded by a cocktail party, courtesy of the suppliers to the industry.

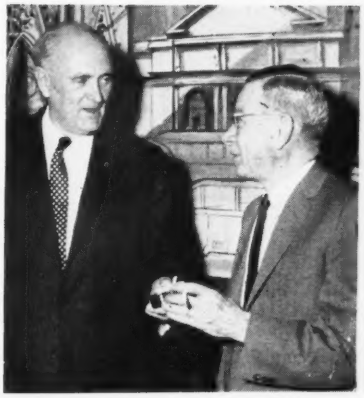
Mr. Peterson first welcomed this "time honored" group to Buffalo and then mentioned the presence of many distinguished persons from the industry at the meeting. Although it was not possible to introduce all of these people, W. B. Wiegand, the Division's 1960 Goodyear Medalist, was presented to the audience.

The chairman also introduced E. B. Busenberg, The B. F. Goodrich Co., secretary of the 25-Year Club, and paid tribute to his work for the group.

The several new members of the 25-Year Club were next asked to stand and introduce themselves; then they

25-Year Club Luncheon: center background before flag, C. H. Peterson, chairman; left to right around table, E. B. Busenberg, secretary; W. D. Parrish; R. G. Seaman; E. H. Krismann; W. Welch; H. F. Van Valkenburgh; W. B. Wiegand; A. E. Juve; H. A. Winkelmann





Dr. Winkelmann presents memento to Gordon Holmes at 25-Year Club meeting held May 4

were welcomed by the chairman. He explained that the new members could obtain their 25-Year Club pin by writing to Owen J. Brown, Jr., Godfrey L. Cabot, Inc., Boston, Mass.

All members of the Club were asked to stand and observe a moment of silence in memory of those Club members whose deaths had occurred since the last meeting. These members were as follows: Henry H. Clapp, The Gillon Co.; Bert Scellen, Kirkhill Rubber Co.; George Weaton, St. Joseph Lead Co.; W. S. Chinery, retired, Industrial Rubber Goods Co.; Paul Gamble, Xylos Rubber Co. Division, Firestone Tire & Rubber Co.; Walter Edsall, Goodyear Tire & Rubber Co.; and C. P. Hall, C. P. Hall Co.

The chairman turned the meeting over to H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Co., for the elimination contest to determine the member present with the longest record of service who had not previously been honored in this connection. Before conducting this contest, however, Dr. Winkelmann mentioned the first meeting of the Club in 1948 and introduced Bill Welch, Midwest Rubber Reclaiming Co., a member who had attended practically all of the meetings of the Club since that time. Also introduced by Dr. Winkelmann was C. W. Christensen, of Monsanto Chemical Co., former treasurer of the Division.

The elimination contest was won by Gordon Holmes, St. Lawrence Chemical Co., who had recorded 49 years of service in the rubber industry, and Mr. Holmes was presented with a suitable memento of the occasion.

It was announced that the chairman of the next meeting of the Club in New York in September, 1960, would be John M. Ball, Midwest Rubber Reclaiming Co.

The meeting was adjourned by Chairman Peterson with thanks to the suppliers to the industry for the cocktail party which had preceded the luncheon-meeting.

Contributed Papers

One of the features of the Buffalo meeting of the Rubber Division was the contributed papers, one entitled "Latest Advances and Break-Through in the Chemistry of Polymers and Polymerization," by Herman F. Mark, international authority on polymers from Brooklyn Polytechnic Institute; and the other, "Latest Advances and Break-Through in the Physics of Polymers," by Peter J. Debye, retired head of the Department of Chemistry at Cornell University and Nobel Prize winner in physics.

Dr. Mark's paper was given at the first technical session on the afternoon of May 4. He was introduced by Dr. Sparks.

In discussing vinyl addition polymerization, Dr. Mark explained that the three essential steps were initiation, propagation, and termination, and that polymer chemists have learned how to control the first two steps quite adequately, but that control of the third step is more difficult.

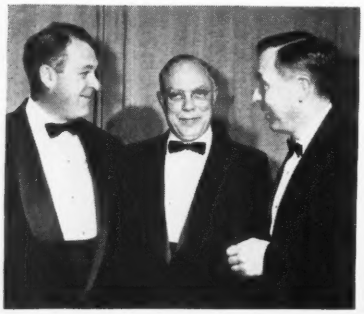
One recent event of great importance for the synthesis of new polymers and copolymers was the discovery of **coordination complex catalysis** in vinyl-type addition polymerization. This discovery led to the synthesis of copolymers of the simplest olefins such as ethylene, propylene, and butylene and to the preparation of high *cis* and *trans* polydienes, all of which proved to be of considerable interest to those working in the fields of rubber chemistry and technology.

Another fact of equal importance, Dr. Mark said, was the recognition of the importance of keeping low-temperature anionic or cationic polymerization reactions completely free of water. The first spectacular result of this knowledge was the preparation of high molecular weight formaldehyde, which results in a hard and tough resin of excellent molding characteristics. It appears that this same principle will lead to many other interesting polymers and copolymers of aldehydes, ketones, and epoxides, some of which are rubbery and represent an interesting combination of properties for practical application in the field of elastomers, Dr. Mark concluded.

The second contributed paper, by Dr. Debye, was given at the beginning of the fourth technical session on the morning of May 6. Dr. Debye was also introduced by Chairman Sparks.

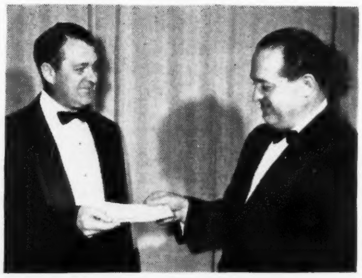
Recently it was shown that the angular dissymmetry of light scattered by mixtures in the vicinity of their critical mixing point can be interpreted and used to measure the range of molecular forces present, Dr. Debye said. This fact is remarkable since it means that lengths of the order, say of 10 Angstrom units, are measured by using visible light that has itself a wavelength of about 5000 Angstrom units. The more details of the angular intensity curve that can be observed the more that can be said about details of the molecular interaction as a function of the mutual distance of the interacting molecules.

A very promising subject for such measurements are solutions of polymers of the coiling type, which should begin to interact at relatively large distances. From the angular dissymmetry observed in diluted solutions the coil dimension can be derived; from a similar dissymmetry observed near the critical point, the range of molecular interaction between such coils follows. A few months ago it was shown that the critical dissymmetry really exists for solutions of polystyrene in cyclohexane. Dr. Debye discussed the results concerned with the mutual interaction of such polymers which can be derived from recent measurements of polystyrene samples covering a range of molecular weights.



Left to right: G. E. Popp, treasurer; L. H. Howland, assistant secretary; W. S. Coe, vice chairman of the Rubber Division

L. J. Halpin, local arrangements chairman, *left*, and C. H. Peterson, chairman, 25-Year Club and suppliers' cocktail party, *right*



Treasurer Popp presents $2,000 Division check for ACS building fund to Ron Warren, who is Society membership secretary

The Goodyear Lecture

Another feature of the Buffalo meeting was the Charles Goodyear Lecture for 1960 given by W. B. Wiegand, retired former vice president in charge of research for the Columbian Carbon Co., on the morning of May 5. Mr. Wiegand's subject was "Determinants in Research," of which a "determinant," according to Webster, "is a cause that fixes the nature of that which results," it was said.

Six research determinants were cited by the Medalist as follows: (1) the teammates; (2) resourcefulness; (3) trend lines; (4) inversion; (5) hunches; and (6) contacts. At the suggestion of Dr. Sparks, "Plus Action" was added to the list.

A research director's teammates should be chosen as carefully as his own helpmate and accorded like consideration, Mr. Wiegand declared, and added that they should be strong where he is weak, various in temperament and training, cooperative rather than compliant, and treated with respect, appreciation, and, above all, deliverance from anonymity.

By resourcefulness is meant imagination and flexibility in working theories, together with contrivance and improvisation in the laboratory. Trend lines are essential and not always pedestrian. Sharp deviations from a sought-after trend may, if confirmed, provide an entirely new approach to the current problem.

When one has run out of working theories, and trend lines look as wide as they are long, it sometimes pays to turn the prevailing theory upside down, and this is inversion. Too many hunches can be unsettling, but a brilliant hunch may lie close to a real stroke of genius, and any researcher is better for exposure to the disciplines and insights of arts and sciences outside his specialty, Dr. Wiegand said in commenting on his six determinants.

He then went on to describe some research efforts at Columbian Carbon with which he had been associated over the years to illustrate how the various determinants were involved. Cited first was the theory of rubber reinforcement of 1920 which stated that the predominating influence was the capacity factor of surface energy: namely, the specific surface, or degrees of subdivision of the pigment. The contributions of three teammates, their resourcefulness, and the establishment of certain trend lines over a seven-year period provided a rationalization of the reinforcement syndrome in terms of specific surface, and the coronation of carbon as the king of the rubber pigments.

In another instance the thermodynamic analysis of elastomers in the crystallizing range was accomplished by the application of new and elegant techniques and by confirmation of an original hunch; while the development of dustless carbon black was attributed to the same determinants, that is, teammates, resourcefulness, and another hunch.

The development of the pH test for carbon blacks resulted from the abovementioned determinants plus an outside contact. The development in 1938 of furnace carbon black with reinforcement equal to that of channel black was attributed to the work of determined teammates, a prolonged struggle with working theories, trend lines, a hunch that some drastic change could be found, and, finally, inversion, it was explained.

The development of the electron microscope and its use in revealing carbon black particles approaching molecular dimensions were said to have resulted from a contact with a favorite professor, the resourcefulness of another teammate, plus action.

Finally, a contact made in 1931 caused the suggestion to be made that suspensions of carbon black might have therapeutic value, and some successes were achieved in this connection before World War II interrupted this work. Present renewed interest in carbon black as a therapeutic agent may mean that, if the determinants are auspicious, carbon black is also capable of reinforcing an elastomer which is at once the most important and the least self-reinforcing . . . Man, the Medalist declared.

The relatively high incidence of hunches and contacts, as decisive factors in research, emerges as perhaps the highlight of the study, but how are these determinants fostered and how do certain individuals acquire the spark which seems to kindle their creativity, Mr. Wiegand asked.

"These attributes belong to the essence, the spirit of man, and research is assuredly an affair, not only of the mind, but also of the spirit, which alone can fire, and inspire each of our determinants of research. This spark, this contagion, cannot be learned, or taught: it has to be caught," Mr. Wiegand concluded.

Business Meeting

At the business meeting of the Division on the morning of May 5, Dr. Sparks first asked for the members to stand and observe a moment of silence in memory of the following members whose deaths had occurred since the last meeting: Henry Clapp, The Gillon Co.; Walter S. Edsall, Goodyear Tire & Rubber Co.; W. Stewart Gocher, Du Pont; C. P. Hall, C. P. Hall Co.; William McGee, Minnesota Rubber Co.; and R. H. Rogers, Jr., Swift & Co.

Dr. Sparks reported that the following had achieved the status of emeritus members (had reached the age of 65): G. L. Allison, consultant; S. G. Byam, recently retired from the Du Pont Company; R. D. Gartrell, recently retired from U. S. Rubber; C. D. Kennedy, Fred Waterhouse Co.; and Fred Marchionna, consultant.

A report by George Popp, Phillips Chemical Co., Division treasurer, stated that deficits totaling somewhat more than $35,000 had accumulated since 1956 because the budgets for *Rubber Chemistry and Technology* and

the "Rubber Bibliography" had been exceeded during that period. Income and expenses are expected to be in balance by 1962. The assets of the Division are such that these deficits can be handled without too much difficulty in the meantime, it was added.

Membership in the Division at 4,155 is at an all-time high. This total includes 2,500 regular members, 600 associates, and about 1,000 subscriptions to *R. C. & T.*

The nominations for officers and directors which have been circulated for letter-ballot among the members of the Division are as follows: chairman, W. S. Coe, Naugatuck Chemical Division, U. S. Rubber; vice chairman, Geo. E. Popp, Phillips Chemical, and H. J. Osterhof, Goodyear Tire & Rubber Co.; secretary, L. H. Howland, Naugatuck Chemical; and treasurer, D. F. Behney, Harwick Standard Chemical Co. Directors from certain Rubber Group areas nominated for a three-year term are: *Akron,* I. G. Sjothun, Firestone Tire & Rubber Co., and M. H. Leonard, Columbian Carbon; *Boston,* W. F. Malcolm, Titanium Pigment Corp., and G. W. Smith, Du Pont; *Buffalo,* John Helwic, Dunlop Tire & Rubber, and John Frankfurth, U. S. Rubber Reclaiming Co.; *Canada,* J. A. Carr, Dunlop Canada, Ltd., and T. L. Davies, Polymer Corp., Ltd.; *Los Angeles,* A. J. Hawkins, Jr., Du Pont, and D. C. Maddy, Harwick Standard Chemical; *New York,* John T. Dunn, Thiokol Chemical Corp., and C. V. Lundberg, Bell Telephone Laboratories.

Division Banquet

The banquet of the Rubber Division held on the evening of May 5 was preceded by the suppliers' cocktail party in the New York and Georgian rooms of the Statler Hilton. The banquet was held in the Golden Ballroom of the hotel, with Chairman Sparks presiding and attracted an attendance of about 525, including many wives of the members and guests who were present at the meeting.

Dr. Sparks first introduced the officers and directors and honored guests at the head table. He then introduced the chairman of the local arrangements committee, L. J. Halpin, Dunlop Tire, and paid tribute to him and his committee for their hard work in making the Buffalo meeting a success. Mr. Halpin in turn introduced and thanked his subcommittee chairman and other members of the local committee for their efforts.

In connection with the Goodyear Medal Award ceremonies, Dr. Sparks introduced John N. Street, Firestone Tire, the biographer for the Medalist. Dr. Street paid tribute to Mr. Wiegand as one "whose efforts convinced our industry of the values of technical research," and added that without the

John N. Street, biographer for Medalist Wiegand

Medalist's research "the modern tire would not have become possible."

In describing Mr. Wiegand's career, Dr. Street first mentioned his education at the University of Toronto where he received a B.S. and an M.S. degree, in 1912 and 1913, respectively. From 1914 until 1925, Mr. Wiegand worked for various Canadian rubber companies in managerial capacities. He joined Binney & Smith Co. in New York as director of research in 1925 and continued in this post until 1936, when he became director of research for Columbian Carbon Co. He was made a vice president of Columbian Carbon in 1948 and retired in 1951, but has served the company in a consultant capacity ever since.

Mr. Wiegand is a past chairman of the Rubber Division, ACS, and a Fellow of the Canadian Institute of Chemists, the American Institute of Chemists, and the Institution of the Rubber Industry of Great Britain.

Dr. Street recounted how the Medalist after his retirement returned to college and took a master's degree from Columbia University's Greek and Latin department in 1956 and then took courses in philosophy and comparative religion at Union Theological Seminary. His most recent studies have been at Columbia again, where he returned for the study of Sanskrit.

The most recent past chairman of the Rubber Division and chairman of its Goodyear Medal Award committee, E. H. Krismann, Du Pont, presented the Medalist to Dr. Sparks who then presented the medal, scroll, and honorarium to Mr. Wiegand. (See cover photo.) The citation mentioned Mr. Wiegand's work in showing the relations between surface of a filler and its reinforcing effect and that reinforcing effect is attributable to surface forces between the filler and the rubber, which wets it. Also mentioned were the Medalist's contributions to improved methods of mixing, heat treatment of carbon black, electron microscope pictures of carbon black particles, the development of furnace blacks, and the contribution of better processing and better quality blacks to better tread wear of tires.

In accepting the Goodyear Medal, Mr. Wiegand expressed his very great appreciation to his fellow members of the Rubber Division for the honor he received and paid tribute to his "teammates" at Columbian Carbon for making it possible for him to receive the award.

The banquet program was concluded with very fine entertainment provided by Estelle Sloan and the Winged Victory Chorus.

Diplomas Awarded at Chicago April Meeting

Twenty-four graduates of the Chicago Rubber Group course in rubber technology were awarded diplomas at the Group's meeting held April 22 at the Furniture Club, Chicago, Ill. The meeting was under the direction of the education committee. Harold Stark, Dryden Rubber Division, Sheller Mfg. Co., as coordinator of the course, gave five of the 24 lectures. The course included a field trip and a final examination. The other 19 lectures were given by recognized experts in their fields.

This course, which has been offered successfully for nine years, is scheduled to begin again in September at the John Marshall Law School. Further information may be obtained from John C. Gallagher, Chicago-Allis Mfg. Co., 113 N. Green St., Chicago 7, Ill.

More than 165 members and guests attended the April meeting and heard Dan Q. Posin, a noted television science instructor and professor at De Paul University, speak on "The Age of Space." After the talk Dr. Posin answered questions on astronomy, space flight, and other matters of general interest.

Al Cobbe, Godfrey L. Cabot, Inc., announced results of the recent election of officers by mail. These results are: president, Stan Choate, Tumpeer Chemical Co.; vice president, Ted Argue, Roth Rubber Co.; secretary, Russ Kurtz, E. I. du Pont de Nemours & Co., Inc.; treasurer, Mr. Stark. The board of directors includes: manufacturers—Al Marr, Judsen Rubber Works; Harold Shetler, Chicago Rawhide & Mfg. Co.; suppliers — Jim Dunne, United Carbon Co.; and M. L. Whitefield, Naugatuck Chemical Division, United States Rubber Co.

Meetings of the Group scheduled for the coming year were announced: golf outing, July 22; regular meetings on October 7, November 18, January 27 (1961), March 10, and April 28.

Technology of Materials and Processing in Retread Uses

Retreading and repairing of tires was the subject of the meeting of the Akron Rubber Group held on April 8 in the Sheraton Hotel, Akron, O. About 500 members and guests attended the technical discussions, suppliers' cocktail hour, and dinner meeting.

The symposium on retreading and repairing started at 2:30 p.m. and was moderated by R. R. Sawdey, Firestone Tire & Rubber Co., who suggested in his opening remarks that the question of new tires *versus* retread in the mind of tire customers and the necessary consideration of the effect any tire design change or compound change may have on retreading make a close look at this rapidly growing industry very important to all.

Introduction to Retreading

The first panel member, an honored and long-time member of the retreading industry, was J. W. Hodgson, also of Firestone. Mr. Hodgson started his talk by some reminiscing and suggested that the real start of the tire repair industry was in the supplying of blow-out patches, inner tube repair patches, lace-on-boot for the outside of the tire, and tire putty to fill up the hole. From this modest beginning the industry has grown to its present $650-million-per-year volume.

The speaker recalled that early tires were worn by scuffing of the sidewall against ruts in the mud or snow rather than by tread wear, thus making retreading impossible. He traced the history of retreading through the third-circle molds, or curing one-third of the tire at a time, to present-day precision molding.

In the opinion of this speaker the retreading business is a growing business, a profitable business, and a depression-proof business. He did warn, however, that retreaders must make a quality product if they are to insure that no legislation curbing or prohibiting retreading will be passed to control the industry.

Camelback Production

The following speaker was E. T. Brodie, The B. F. Goodrich Co., who discussed the "Production of Camelback and Repair Materials." He covered basic production of tread rubber and tread rubber cushion gum, repair materials, sectional repair materials, and special-purpose repair materials. This speaker indicated that many rubber companies and tire companies are engaged in the production of these materials although some of the larger companies sublet their repair material lines to smaller companies that devote almost full time to this type of product. The major difference between retread rubber and tread rubber is the need of long storage stability of the retread compounds, which means safe cure systems, low heat history in production, and controlled storage.

The various types of retread compounds from premium passenger tire through truck, off-the-road, farm, industrial, and airplane service were outlined, and the use of many types of polymers including natural, SBR, oil-extended SBR, and black masterbatched SBR was discussed. Mr. Brodie concluded that with good workmanship and high-quality materials, tires can be repaired and retreaded to give safe, long-wearing usage.

Retread Shop Practices

"Retread Shop Practices" were covered by the third speaker, C. M. Hofmann, The General Tire & Rubber Co. He covered in detail the many steps that are required in retreading a tire and the proper methods to achieve a satisfactory product in each step. These procedures include drying the carcass, inspection, buffing, cementing, application of cap and splicing, curing, and finishing.

Mr. Hofmann suggested that the recapping of a tire should be carried out with similar care and cleanliness as used in dressing an open wound. The proper procedures have been worked out by the major suppliers and should be very carefully followed. If care is used, a very safe and long-lasting tread can be fixed to a sound carcass.

Retreading Equipment

The final speaker of the symposium was C. R. Schlegel, Branick Mfg. Co., who spoke briefly on "Equipment for Retreading" and then ran a color and sound movie describing retreading equipment. A feature of the film was a short introductory narration by Earl Branick, one of the pioneers of the retreading equipment industry, pointing out some of the many developments that have taken place in his lifetime. The film covered such items as air jacks, air wrenches, tire changers, and spreaders as well as buffers and curing equipment.

Dinner Meeting

Speaker for the dinner portion of the meeting was H. Walter Grote with an address on "Grotesques of the Mind." Dr. Grote filled in for the previously announced speaker, "Wild Bill" Alexander, who was killed in a plane crash.

The results of the election of officers were also announced at the meeting and are as follows: chairman, I. J. Sjothun, Firestone; vice chairman, J. H. Gifford, Witco Chemical Co.; treasurer, B. N. Larsen, Naugatuck Chemical Division, United States Rubber Co., and secretary, R. B. Knill, Goodyear Tire & Rubber Co.

Panelists at Akron retreading symposium were *(left to right) standing,* R. R. Sawdey, moderator, and C. R. Schlegel; *seated,* J. W. Hodgson, E. T. Brodie, and C. M. Hofmann

Rhode Island Rubber Club Studies Carbon Black Picture

One of the largest groups to attend a technical session of the Rhode Island Rubber Club assembled at the Pawtucket Golf Club, Pawtucket, R. I., on April 7 to hear a very fine panel discussion on "Carbon Blacks." Following this technical meeting, the group attended the cocktail hour and banquet. Speaker for the after-dinner portion of the program was John Hanlon, sports columnist, *Providence Evening Bulletin,* who discussed sports in general and also showed a colored film of the 1959 World Series.

Gas Blacks

Lead-off speaker for the panel discussion during the afternoon technical session was Alden H. Davis, Columbian Carbon Co., with a talk on "Physical Properties of Channel and Thermal Blacks." This speaker explained the grouping of channel and thermal blacks in one paper by saying that both are, of course, made from natural gas, both are also considered older blacks in length of service to the rubber industry, and both find wide acceptance in the wire and cable industry. He used the terms "thermal black" and "channel black," however, to describe the two classes of carbons.

Davis described quite fully the methods of production of these two classes of carbon black and some of the peculiar features of each.

He next took the channel blacks and described them as falling within the reinforced grades of carbon black. The size of these carbons were listed as being in the range of 25 millimicrons. Since some of the furnace blacks also would fall in this same size range, he took a look at the properties of pH, volatile, and structure to explain the differences in reinforcing properties of the two types.

He also covered the basic properties of the thermal blacks and the way in which they affect compounds containing them. Both thermal and channel blacks were discussed as regards conductivity for use in the wire and cable industry.

Furnace Blacks

The next speaker on the program was Merton L. Studebaker, Phillips Chemical Co., whose topic was "Physical Properties of Furnace Blacks." In his introduction Studebaker indicated that the subject of physical and chemical properties of carbon black as such had been covered quite well so that he would discuss how a few of the physical properties of rubber are altered by the carbon black which it contains.

The action of carbon black and its effect on viscosity was brought out with the general statement that the higher the loading the higher the Mooney viscosity. Also, the fact that finer particle blacks usually cause a greater viscosity black was mentioned. This latter fact is not quite complete, however, because of the effect of the property called "structure" of the carbon black which correlates more directly with viscosity increase than does particle size.

The speaker went on to explain some of the effects of carbon black on reducing nerve of rubber, particularly synthetics, the role it plays in vulcanization, the effect of carbon black on tensile and tear properties of the compound, and its effect on compression set.

Use of Blacks

A talk on "Why, Where, and How to Use Carbon Blacks" was given by Isaac Drogin, United Carbon Co. Dr. Drogin pulled together in one talk many of the individual ideas and bits of information concerning the use of carbon black by the rubber industry that often are taken for granted or passed over as too elementary for mention. This presentation included 20 slides which covered the subject from a list of the available types of black and their producers to functions of blacks and uses of blacks in many different types of applications.

Later portions of this talk covered black masterbatches and some information on mill mixing and Banbury mixing of both loose carbon black compounds and masterbatch based stocks.

Future of Carbon Black

Final speaker of the afternoon session was Walter R. Smith, Godfrey L. Cabot, Inc., who gave a paper entitled, "Future Course of the Carbon Black Industry." While Smith admitted to the dangers of trying to predict the future, he suggested that current developments in quite advanced stages permitted some observations of the immediate future with some degree of certainty.

He confined his remarks to three points: (1) the retirement of blacks made from natural gas, both channel and furnace; (2) the replacement of gas blacks by new grades of oil furnace blacks, and (3) the expansion in production and use of carbon black-latex rubber masterbatch.

In defense of point one, the speaker indicated that this retirement of gas blacks had been predicted since the introduction of furnace blacks in 1943, but although this has been the trend, there are still sizable amounts of gas blacks used. Competition for the basic gas and its effect on the price of gas have, however, made the cost of gas blacks rise sharply and restricted their use to applications requiring the particular properties imparted by these blacks. New developments in furnace blacks have duplicated to a great degree these properties, however, so that the use of gas blacks should decline even faster. These developments which justify point (2) above are also very important in the final realization of point (1).

The third point is borne out by recent production figures in which the production of black masterbatch has risen steadily over the past several years after a previous slowdown. A good deal of the present reason for use of masterbatch is economic, according to the speaker, since the mixing cost is not being entirely passed on to the consumer. A rise in the price of black masterbatches might cause the production curve to level off. Another factor in the picture today, however, is the difficulty of dry mixing the newer low structure furnace blacks. These difficulties can be overcome by the masterbatch technique, thus allowing the use of finer particle size blacks for the superior properties imparted.

F. S. Kipping Award In Organosilicons

The establishment of an annual F. S. Kipping Award in Organosilicon Chemistry under the auspices of the American Chemical Society was recently announced jointly by W. R. Collings, president of Dow Corning Corp., the sponsor, and by the board of directors of the American Chemical Society. One thousand dollars will be given to a scientist for distinguished contribution to knowledge of organosilicon compounds. The selection will be made by a committee of the ACS and will be open to scientists engaged in non-commercial research anywhere.

Professor Frederic Stanley Kipping, of Nottingham University, England, published 119 papers on organosilicon chemistry during the 37 years, 1899-1936, that he worked in the field. He is well known as the coauthor with W. H. Perkin of two textbooks on organic and inorganic chemistry used by many college students.

Organosilicon compounds are commonly known by the name Kipping gave them—"silicones." These compounds are inorganic chains of silicon and oxygen combined with organic units. Since Dow Corning was founded as the first manufacturer of silicones, only 17 years ago, the materials have been used by most industries throughout the world.

Ozone-Aging Methods Compared for NCRG

The April 14 meeting of the Northern California Rubber Group at the Elk's Club in Berkeley, Calif., featured a technical session, followed by a social hour, dinner, meeting, and speaker.

Frank W. Wilcox, Witco Chemical Co., spoke at the technical session on "The Value of the Ozone Test for Estimating the Durability of Rubber Products." Mr. Wilcox, who is in charge of the wax development program at the Witco rubber laboratory in Akron, O., described recent advances in ozone testing and continuing problems of correlation between outdoor exposure and ozone cabinet tests as follows.

The cracking of rubber products, when exposed to weather or ozone, presents a major problem. When rubber under stress is exposed outdoors, it often does not follow a normal expected aging cycle. Its weathering characteristics are therefore highly unpredictable. Factors such as ultra-violet light, extremes in temperature and atmospheric gases, particularly ozone, are directly or indirectly responsible for its erratic behavior.

Since these factors vary with location and season, the true weather aging properties of a rubber compound are necessarily determined by long-term exposure, preferably under actual service conditions. A faster method has been adopted, however, by which the rubber specimen is exposed to ozone at a controlled temperature, usually 100° F. If the sample remains crack free at the end of the exposure period, it is considered satisfactory for use.

Experience indicates that wide discrepancies often exist between the accelerated ozone test and actual outdoor exposure, even on samples taken from the same specimen. Personnel running the tests concluded, therefore, that the accelerated test, as now run, is of questionable value for estimating the outdoor durability of natural rubber or SBR compounds that depend on wax or combinations of wax and antiozonant for protection.

The major cause of the lack of correlation appears to be due to the inability of the accelerated ozone test, which is confined to a very limited set of test conditions, to duplicate natural outdoor weathering where wide variations in temperature, ultra-violet radiation, and ozone concentration are the rule.

It is highly possible, therefore, said Wilcox, to select materials which will bloom and protect the rubber in the accelerated ozone test, but fail completely outdoors where exposure conditions often differ completely from those used in the ozone test.

The after-dinner speaker was James Leefe, partner in the San Francisco architectural firm of Marshall, Leefe & Ehrenkrantz. His topic, "Trends in Architectural Design," covered such items as sealants and sealing methods required for prefabricated sections and flexible thin-shell structures. Other rubber applications in architectural design were also discussed.

Bonding Problems Topic at Fort Wayne

The Fort Wayne Rubber & Plastics Group held its fourth meeting of the 1959-1960 season at the Van Orman Hotel, Fort Wayne, Ind., on April 14. William DeCrease, Hughson Chemical Co., division of Lord Mfg. Co., spoke on "Compounding Elastomers for Rubber-Metal Adhesion." Also, officers and directors for the coming season were announced. A delicious Cornish hen dinner was served to 142 members.

Mr. DeCrease introduced the concept of the "Bondability Index" of elastomers as a means of predicting the ease with which an elastomer may be bonded to metal with organic adhesives. Five common elastomers were assigned indices in terms of decreasing index as follows: nitrile - 10, neoprene - 8, natural rubber - 4, SBR - 3, and butyl - 1.

The effect on adhesion of variations in elastomeric polymers was presented; e.g., the relation between the monomer ratio in "copolymer elastomers" and adhesion to rubber. Specifically, this meant that good adhesion of nitrile rubber is favored by high acrylonitrile content; adhesion of SBR compounds to metal is enhanced by low bound styrene content; higher unsaturation butyl polymers are bonded to metal with greater ease than butyl polymers having fewer double bonds.

The influence of a number of compounding ingredients on the adhesion of elastomers to metals, with emphasis on extension with oils and fillers, was then discussed by DeCrease. In general, ester-type or highly aromatic plasticizers are more harmful to adhesion than are naphthenic or parafinic. Adhesion of various elastomers such as "Viton" A, butyl, "Adiprene" L, "Hypalon," and silicone to metals was discussed with reference to the effects on adhesion by certain miscellaneous additives.

In conclusion, DeCrease described a new method for measuring elastomer-to-metal adhesion.

The following officers and directors were elected for the 1960-1961 season: president, Allen C. Bluestein, Anaconda Wire & Cable Co.; vice president, A. L. Robinson, Harwick Standard Chemical Co.; secretary-treasurer, Carrol Voss, General Tire & Rubber Co.; directors, manufacturers, Bal Connell, General Tire & Rubber Co., and Jack Lippincott, Dryden Rubber Division, Sheller Mfg. Co.; and directors, suppliers, Al Cobbe, Godfrey L. Cabot Co., Inc., and Jerry Zwick, Goodyear Tire & Rubber Co.

The Fort Wayne Rubber & Plastics Group will give a "Rubber Technology Course" designed for people with limited or no technical background. The course, beginning on September 1, will consist of 12 lectures on rubber and four on plastics. The rubber lectures will be given on Thursday nights at 7:30 p.m. at the Anaconda Wire & Cable Co., Marion, Ind. All applications should be sent to the attention of Allen C. Bluestein at Anaconda.

Seated at the head table of NCRG's April meeting were *(left to right)*: vice president, K. Large, Oliver Tire & Rubber Co.; after-dinner speaker, James Leefe; technical speaker, Frank Wilcox; president, B. W. Fuller, Du Pont; secretary, D. M. Preiss, Shell Development Co.

Elastomer/Plastics Group Holds Annual Short Talks Symposium

The final meeting of the 1959-1960 season of the Elastomer & Plastics Group, Northeastern Section, American Chemical Society, was held May 17 at Science Park, Charles River Dam, Boston, Mass. The session took the form of an annual Short Talks Symposium, chairmanned by Henry S. Anthony, Tyer Rubber Co., who introduced the four speakers. The technical session was preceded by the usual cocktail hour and a catered dinner in honor of the panel; 55 attended.

The first speaker was Melvin Silberberg, Plas-Tech Equipment Corp., who discussed "Ultimate Strength Tests as a Measure of the Time-Dependent Behavior of Polymeric Systems, with Special Emphasis on Rubber-Modified Systems."

The importance of matching the speed of testing, in the evaluation of tensile strength of materials and the adhesive values of bonds, with the actual service stress requirements placed on the product, was stressed by the speaker. He showed that the normal testing procedures often failed to predict properly service life of many products because they did not properly evaluate the relation of load rate to performance, which frequently varies as the logarithm of time. Two cases were cited, and pictures of the equipment used were shown on slides.

In the first case, parachute cords of nylon, seven years on the shelf, were adjudged unsatisfactory because of normal aging expectations, but standard tests failed to reveal this to be so. However, when these cords were tested at speeds up to 5,000 inches per minute, which simulated the strain of the opening of a parachute in use, the resultant failures showed the cords actually to be defective.

The second case given by Silberberg involved lap shear evaluation tests of adhesives over a range of temperatures to determine the effect of rubber addends in the epoxy resin system used.

Strength tests increased the value as the thickness of the layers decreased, especially at higher speeds. It was shown, however, that at low speeds the failure was cohesive (within the layer); while at high speeds the separation was between adhesive and metal, indicating a change in the type of failure met at higher speeds.

The same effect was found in the evaluation of rigid urethanes, for at slow speeds the sample showed a rough, torn, fractured surface; whereas at high speeds the surface appeared nearly plane, or smooth.

The second speaker of the symposium was Harold D. Dietrich, General Magnesite & Magnesia Co., who dealt with "Some Aspects of Chemical Magnesias."

After describing the Pattison process for the conversion of dolomite to magnesium carbonate and magnesia, Dietrich characterized the three commercial classes of magnesia used in rubber compounding. He indicated that with increasing use of medium-light magnesias, the extra-light grade, though producing a superior cure and easier processing, was gradually losing popularity and would eventually disappear.

The third speaker was N. Grover Duke, B. F. Goodrich Chemical Co., whose topic was "New Fluids — New Rubber Problems." The modern trend toward putting additives in brake fluids, steering fluids and lubricants used with automotive and aircraft hose and seals has been outpacing the production of new types of elastomers to resist satisfactorily the effects of these fluids at operating temperatures, Duke said. Discussion followed of EP-type lubricants, phosphate esters, glycol and mineral-oil based brake fluids and silicate esters; diester lubricants; higher aromatic fuels, and the fluids involved in astronautics, including hydrazine, nitromethane, ethylene oxide, hydrogen peroxide, fuming nitric acid, liquid oxygen, ozone, and fluorine.

Slides were used to illustrate the relative resistance of the various general- and special-purpose elastomers over portions of the temperature range of —70 to 500° F., as well as to compare the effects of aniline point and aromatic content of petroleum oils and fuels on some of them.

The final speaker was William H. Crandell, Frederick S. Bacon Laboratories, who reported on the "Effect of Reactive Diluents on the Coefficient of Expansion of Epoxy Resins."

Encapsulation materials used with military electronic and guidance system parts for use in the —70 to 160° F. range require dimensional stability, or expansion characteristics equivalent to those of the materials enclosed. Reactive diluents become part of the set materials, and are also used to reduce viscosity during enclosure, and to permit use of larger quantities of fillers. Negative filler expansion coeffcients and correct amounts of such fillers and olefin oxide diluents were shown in demonstration of one method developed by the speaker to produce uniform expansion conditions in potted parts.

The next meeting of the Elastomer & Plastics Group will be on October 17, the annual meeting and election of officers. Speakers of the evening are to be announced; and it is expected that the meeting will be at Science Park, Boston.

Chairman for the coming year is Henry A. Hill, National Polychemicals, Inc.

New York Group Dances

The first dinner-dance of the New York Rubber Group was held at the Hotel Roosevelt, New York, N. Y., on May 20. About 100 couples attended the affair, which consisted of a suppliers' cocktail hour followed by dinner and dancing in the Palm Terrace suite of the hotel. Table favors were given to each lady present.

Those present seemed to enjoy themselves very much, and the consensus, particularly among the ladies, was that the dinner-dance should be repeated at some future date.

International Rubber Symposium in London

The Second (1960) International Synthetic Rubber Symposium and Rubber Exhibition will be held at Church House, Westminster, London, England, October 11-13, 1960. An application form and program of lectures and events are available from the British journal which is organizing the Symposium, *Rubber and Plastics Age*, Gaywood House, Great Peter St., London, S.W.I, England.

All travel and accommodation arrangements for delegates from North America are being handled by "Worldways," 475 Fifth Ave., New York 17, N. Y., to whom application should be made for particulars. A special charter flight is being planned from New York.

A provisional lecture program (thus far available) follows:

"New Controlled Structure Polymers of Butadiene." W. W. Crouch, Phillips Petroleum Co.

"Rheological Properties of Cis-Polybutadiene and Other Polymers." Dunlop Rubber Co., Ltd.

"Polybutadiene Rubber." E. F. Engel, Chemische Werke Huls.

"High Solids SBR Latex by a Chemical Promoted Agglomeration." L. H. Howland, E. J. Aleksa, R. W. Brown, E. L. Borg, Naugatuck Chemical Division, United States Rubber Co.

"The Dynamic-Mechanical Properties of Filler-Loaded Vulcanizates." A. R. Payne, Research Association of British Rubber Manufacturers.

"Tread Wear Indices of Various Synthetic Elastomers Measured in Varying Severity Road Tests." R. L. Marlowe, R. F. Miller, J. L. Ginn, B. F. Goodrich Co.

"Polyisoprene Rubber." Shell Chemical Co.

"Vulcanization and Elastomeric Properties of Ethylene-Propylene Copolymers." Giulio Natta.

"Preparation and Properties of Chlorobutyl." F. P. Baldwin, Esso Research & Engineering Co.

(Continued on page 129)

WASHINGTON REPORT

By JOHN F. KING

Highway Users Conference Plans for the Dynamic Sixties

The chairman of the board of one of the Big Five rubber companies has been elected chairman of the National Highway Users Conference, succeeding another rubber industry leader, who stepped down after two consecutive two-year terms.

The election of H. E. Humphreys, top man at United States Rubber Co., to head NHUC for the next two years was announced at the eighth Highway Transportation Congress held here May 10-12 at the Mayflower Hotel. Humphreys succeeds William S. Richardson, B. F. Goodrich Co. director, who has had the helm of NHUC since 1956.

Election of Humphreys as 1960-61 chairman of the Conference, a body of 2,000 state and local highway user groups embracing such interests as automobile clubs, bus and truck associations, farm groups, and commercial distribution trade organizations, gives the rubber industry two of NHUC's four chairmen in its history. Prior to Richardson, only Alfred P. Sloan and Albert Bradley had served as Conference chairmen.

Humphreys Emphasizes Planning

In his acceptance speech winding up the three-day meeting, Humphreys called for careful, long-range planning as the only solid basis for realization of the full potential of highway transport in the decade ahead.

Discussing "What's Ahead in the Dynamic Sixties"—the theme of NHUC's Eighth Highway Congress—Humphreys said the United States can look forward to fulfillment of its highway needs over the next 10 years only if there is sound, advance planning of road construction now. Noting that today's 71 million motor vehicles will swell to 100 million by 1970 and that our present 17,000 miles of dual highways will expand to 70,000 in the same period, the U. S. Rubber chief declared that "adequate transportation ranks well up among major concerns" of the American people such as the need of more hospitals, more recreation areas, more water resources, and more employment opportunities.

In line with his plea for sound planning, Humphreys called on the delegates not to be afraid of new ideas, "keeping in mind that the traffic conditions of 1950 are old fashioned in the light of the 1960's and that today's will probably be 'old hat' by 1970." He said he opposed "change for the sake of change," but argued that it is necessary to "keep pace with changing times."

"I hope that our next President, whoever he may be, will be devoted to promoting freedom of movement throughout our country," the new NHUC chairman said.

Richardson Condemns New User Taxes

His predecessor, Richardson of Goodrich, ended his term as Conference chairman with a scathing attack on the Commerce Department for advocating new user taxes to finance the construction of mass urban transportation systems. He urged the Congress to consider taking control over construction of the 41,000-mile National Defense Highway Program out of the Commerce Department and setting it up in business under an independent Federal Highway Board.

Noting that the Commerce Department mass transport recommendations issued early this year urged the taxation of users of city expressways to pay for new urban transport services, Richardson declared: "That is what you call taking the highway users for a real ride!

"If they put a toll on city expressways, it might be a good idea if they tell the archaeologists to stand by to examine the remains of the cities," he said. "The only thing they forgot to put in the report," he continued, was "a recommendation that walls, like the ancient walls of Jericho, be built around such urban centers so no highway users could sneak in the back door. . . .

"You folks representing highway

Panel members in a symposium, "The Sixties: a Dynamic Decade!" at the Eighth Highway Transportation Congress were: *(left to right)* front row: W. J. Sweeney, vice president, Esso Research & Engineering Co.; Bryson Rash (moderator), WRC-NBC radio and television news commentator; John N. Street, director of chemical laboratories, The Firestone Tire & Rubber Co.; and Ralph H. Isbrandt, director of automotive engineering and research, American Motors Corp. *Back row:* Ross R. Ormsby, president, The Rubber Manufacturers Association Inc., who presided at the session; and William S. Richardson, director, The B. F. Goodrich Co., outgoing chairman of NHUC

H. E. Humphreys, Jr., *(left)* chairman of the board, United States Rubber Co., accepts the gavel as new chairman of the National Highway Users Conference from the outgoing chairman, William S. Richardson, a director of The B. F. Goodrich Co.

users," Richardson told the NHUC delegates, "better close ranks and stay tightly closed against the financial inroads of these marauding schemes. It will be necessary to raise your voices and have them heard throughout the land."

He declared that to tax highway users to pay for mass urban transportation is not the answer to city traffic congestion. He compared the Commerce Department's recommendation to taxing "airplane riders to provide money to rehabilitate the railroads, or to place a new tax on railroads to restore the horse and buggy."

In his appeal to pull the highway building program out of the Commerce Department's jurisdiction, Richardson said, "I hold no animosity toward that great body [the Department], but I believe that they have too many interests to serve other than highway users and highway taxpayers. Perhaps some later U. S. Congress will see fit to deal with this matter more objectively."

In the meantime, he concluded—referring to assertions by Labor Secretary James P. Mitchell that highway users are "subsidized"—NHUC "must be ever-alert to guard against these misconceptions on the part of government officials and to make sure that the Highway Trust Fund [the special federal account of highway user taxes which finance road construction] and other highway taxes are not subjected to financial rape."

Panel on "Dynamic Sixties"

Another highlight of the May 10-12 Highway Congress was the symposium on the outlook for the "Dynamic Sixties" in which panelists were: for motor vehicles, Ralph Isbrandt, head of engineering and research at American Motors Corp.; for petroleum, W. J. Sweeney, vice president of Esso Research & Engineering Co.; and for rubber, John N. Street, director of the Firestone Tire & Rubber Co. chemical laboratories. Presiding was Ross R. Ormsby, president of The Rubber Manufacturers Association, Inc.

Firestone's Street recited the gains over the past 10 years in rubber research and development which have given the American traveling public safer and longer-wearing tires and then predicted that "the rate of progress in the next 10 years will far outstrip the past performance."

Referring to the recent development of synthetic-natural polyisoprene and polybutadiene rubbers, Street said the new polymerization techniques used to produce these new synthetics "open the door for a whole family of new rubbers, some of which already are coming out of the test tube stage, but which have not progressed sufficiently far to clarify their future potential value." He said that "there can be little question but that the next few years will see further additions to the rubber family and, therefore, additional tools to enable the tire engineers to build a better product."

Turning his attention to tire fabrics, Street predicted that continued competition among rayon, nylon, and, more in the future, Dacron-type fibers, will force the rubber industry's researchers further to improve existing fabrics or find new ones. And with increasing speeds permissible on better highways, he said, "The ability to control the automobile and particularly to stop throws more responsibility on the tread design." This aspect of rubber research is receiving "considerable study."

Esso's Dr. Sweeney forecast for the coming decade such radical new non-tire developments as multicolored road surfaces to help motorists find their way easier and to indicate speed zones; better and cheaper automotive lubricants; new and more effective rust preventatives; more durable paints and enamels; and a "super-strength, all-but-indestructible" asphalt paving compound.

Sweeney told the gathering that tough butyl rubber also is being used experimentally in the Midwest for highway guard-posts. He declared that "vehicles moving at 60 miles an hour can be brought to a stop by three butyl rubber posts in a series—with no serious damage to driver, car, or posts." He foresaw, in addition, the introduction of synthetic rubber-based sheeting for removable safety markers at school and pedestrian crossing zones. With "several companies at work on the idea," Sweeney stated, the sheets can be rolled out when needed and then rolled back up again.

The American Motors representative, Isbrandt, declared that the two main efforts to be made in the decade ahead are (1) to try to close the gap between new highway construction and increased automobile use; and (2) to increase the ability of motorists to use vehicles with greater safety and convenience.

This speaker also predicted that the average size of the car of the 1960s "is likely to be reduced in the overall." Even the non-compact cars are growing somewhat smaller externally, "responding to traffic flow, parking and congestion problems," he explained. The combined effort to produce better highways, motor vehicles, and drivers in the years immediately ahead holds out hope of a drastic reduction in the nation's highway fatality rate, Isbrandt concluded.

Another highlight of the Congress was a panel discussion which arrived at a conclusion, agreed on by all panelists, that the phenomenal success of the small car threatens to unhinge the financing plan of the interstate highway construction program.

The panelists decided that if the trend to smaller cars—both imports and Detroit's compact models—continues at the present rate, gasoline tax revenue by 1964 would be about $550 million below current estimates for that year. Little cars using less gas, hence producing less tax revenue, would cut federal revenues by $217 million and state revenues by $331 million.

Many Other Recommendations

Winding up the Congress, six committees charged with investigating highway progress, administration, safety, taxation, finance, and legal problems submitted a string of recommendations for future NHUC policies in these fields. The recommendations are not binding on the Conference and are considered advisory only.

Rubber Footwear Industry Asks Curbs on Low-Price Foreign Imports

The rubber footwear industry has decided to ask the government to impose restrictions on imports of competing, low-price products from the Orient. The decision to proceed with a petition to the Tariff Commission was made May 17, although it will take some time to pull together the necessary data on which to base a formal plea.

Long harassed by competitive imports from low-wage countries, the rubber footwear producers in this country have delayed seeking government aid

in checking foreign competition in the United States market because their case could not easily be substantiated.

Imports Exceed U. S. Output

But industry spokesmen now say that regardless of the detailed statistical breakdown of the import flood, the foreign share of the U. S. market has grown too much and too fast. These figures are cited: total U. S. footwear imports jumped from 7 million pairs in 1957 to 54 million in 1959. In the first quarter of this year—for the first time in history—imports have exceeded domestic production. The comparative figures are 30.8 million pairs imported and 28.2 million produced here. The total expected to be imported for the whole year is 121 million.

These figures were brought to the attention of Sen. Leverett Saltonstall (Rep., Mass.) at a May 17 meeting with industry and labor representatives in which it was indicated a petition with the Tariff Commission for relief would be filed. The same figure —along with protest petitions from labor unions representing rubber footwear plants in Massachusetts—had been circulated among various departments of the government earlier in the month. Neither the petitions nor the industry and labor spokesman present at the Saltonstall meeting have indicated precisely what sort of import controls they want. But they make clear that the curbs should be severe.

Meeting with Saltonstall were W. E. Brimer, president of Tyer Rubber Co., Andover, Mass., who acted as group spokesman: C. P. McFadden, chairman of the Rubber Manufacturers Association's Footwear Division: and Donald Hiss, a member of the Washington law firm of Covington & Burling which has been retained by RMA to determine first what provision of trade law offers the best prospect for import relief and then to proceed with the formalities. Also attending the meeting were representatives of The B. F. Goodrich Co. and United States Rubber Co., which have New England footwear plants, as were representatives of several government agencies.

Following the meeting Hiss told newsmen that he must comb through Census Bureau import statistics to "get the facts" and then file the necessary papers with the Tariff Commission.

Opposition Voiced

Washington attorney Noel Hemmendinger, who represents the Japanese footwear makers who currently are the main source of irritation for the U. S. industry, asserted later that the meeting was "just another one of the moves the American companies have been making to scare the Japanese into adopting a voluntary export quota." He said any proceeding at the Tariff Commission will make it "very difficult for the U. S. industry to prove it's being injured." He claimed the great bulk of the admittedly large import total is made up of Japanese-type "Zore" sandals, an item which he said the U. S. industry does not make.

Hong Kong Imports

While the U. S. footwear producers girded themselves for battle with the Japanese, the Commerce Department spotlighted another potentially strong foreign competitor looming on the horizon.

The Department's Business & Defense Services Administration, in a special report on Hong Kong's growing rubber footwear industry, estimated that 90% of the Colony's total output goes into export—the base production figure was not given. It added that 71 factories employing more than 7,000 are crowded into the settlement.

Total shipments of both rubber-soled shoes with fabric uppers and other types of "rubber footwear" from Hong Kong to the U. S. in 1958 were valued at more than $15 million. Total value of imports for the first 10 months of 1959 was shown as only about $8.5 million, but the reduction is accounted for by a change in import duty classification which subjected imports after September 1, 1958, to a higher rate of duty based on the American Selling Price Principle. The increase was authorized by legislation closing a tariff loophole importers had been exploiting until 1958.

The BDSA report summed up by noting that "low labor rates in Hong Kong" — which in the Colony's footwear industry ranges between six and 14 cents an hour—"give a tremendous cost advantage in view of the large amount of handwork in footwear production. Furthermore, the textiles used are purchased at a much lower price than in the U. S." because of the U. S. Government's subsidy of raw cotton exports.

Minimum of $1.77 per Hour Set For Work under Government Contract

Beginning June 3, any manufacturer of rubber tires and related products wishing to qualify for government contracts will have to be able to show that he pays his labor a minimum wage rate of $1.77 per hour.

This was decreed by Labor Secretary James P. Mitchell on May 4, following a protracted survey of the tires and related products industry to determine the minimum prevailing wage as required by the Walsh-Healey Act. That law authorizes the Secretary of Labor to set the minimum rate that must be paid employes working on federal procurement contracts.

Ends 10-Year Dispute

Mitchell's order ended a 10-year running dispute between the rubber industry and the Federal Government which saw the Labor Department make a number of false starts toward fixing a Walsh-Healey minimum for the industry, but the Department never did carry through until now.

Rubber industry management decided actively to oppose promulgation of the wage order after Mitchell last fall issued a tentative finding that the prevailing minimum—without which no manufacturer could get a federal contract in excess of $10,000 unless he paid it to his employes—was $1.77 per hour. Management's opposition sprung from a fear that if it didn't fight the order, the industry would be an "easy target" for higher minimum wage findings later, or that the wage floor could be extended to other, non-tire segments of the industry where they do not now exist.

Rubber industry labor, spoken for by the United Rubber Workers Union, was largely indifferent to the whole issue. URW leaders made it clear that their chief lever for raising wages would continue to be collective bargaining, not government fiat.

Despite management's protest, filed last December in a Rubber Manufacturers Association brief, Mitchell last month pegged the minimum at precisely the same figure he had tentatively decided upon in the Fall of 1959.

Specifically, the overall $1.77 per hour minimum will apply to contracts for which invitations to bid on federal orders are solicited or otherwise negotiated. In addition, the minimum provides that beginners or probationary workers may be employed at a rate of $1.67 an hour for a period not to exceed 160 hours.

Employment of apprentices and handicapped workers at special rates less than $1.77 an hour is permitted if conditions laid down in other Walsh-Healey regulations are met.

Mitchell's Order Available

The full text of Mitchell's order, which includes the Department's definition of the industry, was published in the May 4 *Federal Register*, and copies may be obtained from the Department's Wage and Hour and Public Contracts Division.

More 1958 Census of Manufactures—Synthetic Rubber; Tires, Tubes

TABLE 1. QUANTITY AND VALUE OF SYNTHETIC RUBBER SHIPPED BY ALL PRODUCERS IN THE UNITED STATES: 1958 AND 1954

(Includes quantities and value of these products reported not only by establishments classified in the synthetic rubber industry, but also by establishments making these items as "secondary" products in other industries.)

Product Code	Product	1958 Total Production (1000 Pounds)	1958 Total Shipments Including Interplant Transfers: Quantity (1000 Pounds)	1958 Total Shipments Including Interplant Transfers: Value ($1,000)	1954 Total Production (1000 Pounds)	1954 Total Shipments Including Interplant Transfers: Quantity (1000 Pounds)	1954 Total Shipments Including Interplant Transfers: Value ($1,000)
2824	Synthetic (chemical) Rubbers, total†	*	*	603,907	*	*	392,194
	Synthetic (chemical) Rubbers and other synthetic elastomers, vulcanizables:						
2824011	Excluding carbon black‡	2,237,208	2,246,887	560,040	1,285,117	1,328,942	348,610
2824051	Including carbon black§	291,744	269,315	43,867	219,841	225,643	43,584

*Not applicable.
† Excludes data for polyvinyl-type and non-vulcanizable elastomers, classified by respondents as plastics materials.
‡ Weight includes copolymer and oil.
§ Weight includes copolymer, oil, and carbon black.

Some more advanced information from the 1958 Census of Manufactures for the rubber industry[1] is available with the publication of "Industry and Products Reports" for the synthetic rubber industry, tires and inner tube industry, and rubber products, not elsewhere classified, industry, MC(P)-28B-2, MC(P)-30A-2, and MC(P)-30A-4, respectively, dated February 10, 1960. The reports are available at 10¢ each from the Bureau of Census, Washington, D. C., and United States Department of Commerce field offices.

Synthetic Rubber

During 1958, manufacturers in the synthetic rubber industry shipped products valued at $536 million, an increase of 48% over 1954 shipments; value added by manufacture in the industry amounted to $199 million in 1958, an increase of 39% from 1954 figures. Average employment in this industry showed an increase of 9% from 1954 to 1958 to a total of 9.3 thousand employes in 1958.

Table 1 shows the quantity and value of synthetic rubber shipped by all producers in 1954 and 1958.

Tires and Inner Tubes

During 1958, manufacturers in the tires and inner tubes industry shipped products valued at $2,520 million, an increase of 26% over 1954 shipments; average employment (all employes) decreased 6% from 1954 to 1958 to a total of 87.2 thousand employes in 1958; and value added by manufacture in the industry amounted to $1,155 million in 1958, an increase of 32% from 1954 figures.

Table 2 shows general statistics for the tire and inner tubes industry for 1954 and 1958 (in the United States). Value of tires and inner tubes shipped by all producers in the United States, while available in the report, are not reproduced here.

TABLE 2. GENERAL STATISTICS FOR THE TIRES AND INNER TUBES INDUSTRY IN THE UNITED STATES: 1958 AND 1954

(Standard Industrial Classification Code 3011)

Item	1958*	1954*	% Change 1954 to 1958
All employes			
Number	87,200	92,700	−6
Payroll	$510,600,000	$441,600,000	+16
Production workers			
Number	68,300	74,000	−8
Man-hours	129,900,000	138,000,000	−6
Wages	$381,800,000	$334,100,000	+14
Value added by manufacture, unadjusted	$1,114,000,000	$844,500,000	+32
Adjusted	$1,155,300,000	$877,800,000	+32
Cost of materials, fuel, electricity, and contract work	$1,353,200,000	$1,115,800,000	+21
Value of shipments	$2,519,900,000	$1,997,400,000	+26
Capital expenditures, new	$70,600,000	$67,400,000	+5
Number of establishments with 20 or more employes	55	46	+20

* The figures in this report include the results for establishments located in the continental United States. Alaska and Hawaii will be covered separately.

Rubber Products, N.E.C., Industry

During 1958, manufacturers in the rubber products, not elsewhere classified, industry shipped products valued at $1,954 million, an increase of 10% over 1954 shipments. Average employment in this industry showed a decrease of 8% from 1954 to 1958 to a total of 122.3 thousand employes in 1958. Value added by manufacture in the industry amounted to $1,027 million in 1958, an increase of 8% from 1954 figures.

Tables in this report cover general statistics for rubber products, not elsewhere classified, in the United States and by regions and states; and value of rubber products, not elsewhere classified, shipped by all producers in the United States. They are not reproduced here because of lack of space.

[1] RUBBER WORLD, Apr., 1960, p. 125.

RMA Committee Reports On Meeting with FDA

Following a meeting with eight officials of the Food & Drug Administration on April 7 in Washington, D. C., the Special Subcommittee on Rubber Products Used in the Food and Beverage Industry of The Rubber Manufacturers Association, Inc., circulated a report to the manufacturers of the several thousand rubber products used in the packaging and processing of foods and beverages.

The chairman of the RMA subcommittee, R. E. Lamb, Waukesha Rubber Co., said in this report that as a result of the earlier meeting with the FDA, rubber manufacturers have a much better understanding of their position with respect to the Food Additives Amendment of 1958. It is now understood that many, if not most, of the food handling products made by the rubber industry will not be affected by the new amendment.

Mr. Lamb pointed out that a top FDA official had expressed the view that "from a legal standpoint, rubber

manufacturers may not be affected by the law and are, therefore, exempt from its provisions, if their products meet any of these three criteria:

"(1) During the product's use it cannot reasonably be expected to become a component of the food or otherwise affect the characteristics of the food;

"(2) During its use, it does impart a component to the food and that component is generally recognized as safe; and

"(3) The use of the product was specifically sanctioned or approved by FDA prior to September 6, 1958."

The subcommittee report made the point that the vast majority of rubber products in use today will have to be cleared under provision No. 1 since few rubber products were specifically sanctioned prior to September 6, 1958, and it has already been shown that it is difficult accurately to determine extractables from finished rubber products.

The report stressed the fact also that if No. 1 is used, then a definition of the word "reasonable" is needed. Rubber manufacturers recognize that they cannot expect FDA "to establish safe limits on the presence of additives in food that are of unknown composition. On the other hand, for the vast majority of products, it can be shown by simple calculation that the material loss in the product is so small that it would be quite safe in applying the term reasonable."

The subcommittee discussed two proposed test methods for analyzing rubber products for compliance with the FDA amendment, and these test methods have been circulated to manufacturers for use in a 30-day evaluation. The results will be reviewed later with the FDA to determine if the methods are acceptable.

The FDA suggested also that it is possible that all but a very few of the presently used chemicals in the rubber industry could be screened by FDA and cleared as safe for use in rubber products. Manufacturers would then have available a list of materials on which the FDA had expressed a favorable opinion. If manufacturers compounded their products from these materials, they could with perfect safety inform their customers that these products were considered safe by the FDA.

Such a list is being compiled and will be presented to the Deputy Commissioner so that it can be published in the *Federal Register*.

GSA Offers #1 RSS AT 7/8¢ Off Market

The General Services Administration announced a new wrinkle in its program of selling off excess natural rubber from the National Stockpile. Early in May, GSA said it would shave ⅞¢ per pound off the market price of nearly 28,000 tons of #1 RSS it wants to dispose of.

The only catch is that the buyer, if he chooses to take advantage of the discount, must take the stockpiled #1 RSS on an "as-is" basis. Judging from GSA's past experience, it will find more than enough buyers in a rising rubber market eager to buy at the discount. The market has not boggled, but kept climbing upward despite a series of announcements of government disposal operations which, in years past, would have sent it tumbling.

In announcing on May 2 that it had 27,995 long tons of #1 RSS available for sale at the ⅞¢ discount in lieu of rotation, GSA listed a total of 59,219 long tons of smoked sheet, thick and thin crepe, and Liberian grades from which buyers could choose. Only the #1 RSS would be discounted, however.

GSA also announced that total rubber stockpile sales in April were 3,651 long tons, bringing to 61,280 tons the total sold off under the old rotation program. The House Appropriations Committee removed the necessity of replacement last year. Stockpile sales after fiscal 1960 closes on June 30 will be permitted under a special concurrent resolution of Congress authorizing the sale of 470,000 long tons of excess rubber over the next few years.

This resolution had been approved by the House earlier this year and mid-May passed the Senate. It is expected to be signed directly by President Eisenhower.

INDUSTRY NEWS

Rubber Product Quality Assurance Explained to Appliance Makers

B. J. Ferkes, Firestone Industrial Products Co., division of the Firestone Tire & Rubber Co., in a talk before the American Home Laundry Manufacturers' Association at its 1960 convention in Hollywood-by-the-Sea, Fla., on April 28, made several important points with regard to quality assurance for rubber products to the members of this Association. His talk was entitled "Rubber Quality in the Sixties" and emphasized that the individual in charge of procuring rubber products for a firm should: (1) Understand the language of rubber in design and engineering. (2) Have a knowledge of the material properties of the various types of rubber. (3) Use the experience of the rubber products manufacturer in his procurement activities. (4) Establish with the manufacturer definitions for acceptable products. (5) Assure himself that adequate controls are being used during the manufacturing operation for these rubber products.

Much misunderstanding would be eliminated if those connected with design would realize that in the evaluation of rubber products a complete knowledge of the exact terms used to describe their characteristics is necessary. It is also necessary to understand how tests are conducted and to recognize there is a definite lack of correlation between most of the test values and actual serviceability, it was added. Examples of the differences between the definition and the use of the terms tensile strength, modulus, aging, etc., as applied to rubber as opposed to other materials, were cited.

In connection with material properties it was pointed out that the design engineer now had a multitude of materials compared to the late 1930's and early 1940's, some of which excelled in one characteristic or another and at the same time were very poor in certain other characteristics. The problem of the design engineer is to be sure he picked the right rubber to do the best job in the product being designed.

Design engineers in companies buying rubber products tend to overspecify or set up very tight tolerances, which are sometimes unnecessary, and increase the cost. On the other hand, rubber products manufacturers sometimes find buyers specifications set up too loosely so that improper functioning of the product would result. Cooperation between customer and vendor

B. J. Ferkes

should result in items with less quality problems.

In connection with sampling and inspection, the concept of what makes a defective part must be established definitely between customer and vendor before volume production is started. These descriptions should include drawings indicating dimensional tolerances, along with material specifications; also, such characteristics as surface finish and any characteristics requiring special tests should be pointed out, it was explained.

From the cost standpoint most customers are willing to accept a small percentage of off-standard parts which were produced under conditions that were within an Acceptable Quality Level or Statistical Quality Control, for when the out-of-tolerance number of parts is small, and the degree to which out-of-tolerance parts is small, the safety factor in design tolerance makes these parts acceptable for use. It is extremely difficult to convince many buyers, however, that 100% inspection, although not impossible, is certainly improbable and surely impractical in many cases, Mr. Ferkes said.

It was emphasized that Acceptable Quality Level is not to be confused with quality control, for the latter is a function that is properly carried out during the manufacture of products wherein the manufacturer has set up controls at suitable process points, beginning with the acceptance of raw materials to the final stages of shipping to assure quality products. Lack of control at any critical point can result in deficiencies in product quality, the speaker added.

The 1960's will see an unprecedented number of new developments in the fields of rubber and rubber products, and there will be greater demands on rubber products used in the appliance field, but if the rubber goods manufacturer and the buyer understand each other's language and problems better along the lines discussed, the rubber industry is well set to meet the challenge, Mr. Ferkes concluded.

Shell Polyisoprene Capacity Will Triple

Shell Chemical Co., Torrance, Calif., will triple its projected plant capacity for the production of polyisoprene synthetic rubber, it was recently announced by Richard C. McCurdy, company president, and J. P. Cunningham, general manager of the company's synthetic rubber division.

This expansion will involve construction at an undisclosed Midwest location of an integrated monomer-polymer plant of 80 million pounds' annual capacity, the hydrocarbon feedstocks for which will come from Shell's Wood River refinery near St. Louis, Mo.

Shell Isoprene Rubber has been manufactured commercially on a scale of up to five tons a day at Torrance, for slightly over a year, enabling consumers throughout the country to evaluate it in a variety of products. The California plant is currently being expanded to a capacity of 40 million pounds a year of polyisoprene, with completion of construction expected this fall. The second installation, presently in an advanced stage of engineering design, will be on stream about one year later.

Mobay Flameproofs Polyether-Type Foam

A technique for producing flame-resistant urethane foam of the polyether type is described in a new technical information bulletin available from Mobay Chemical Co., Pittsburgh, Pa., supplier of isocyanates and other basic urethane chemicals.

Mobay's research work with the flameproofing agent, tris (beta-chloroethyl) phosphate (TCEP), reveals that the burning rate of polyether foams can be decreased appreciably by adding a small amount of TCEP to the foam mix, and the foam can be made completely self-extinguishing, reports Mobay, with the addition of higher proportionate amounts.

The foaming process used in these research tests was the "one-shot" polyether system, also developed by Mobay early last year. Various technical data showing the effect of different amounts of TCEP on the flammability characteristics of foam based on a polypropylene ether triol are included in the new bulletin.

Without the inhibitor, polyether foam is said to burn at a rate lower than that of latex foam rubber under the same conditions. However, the self-extinguishing properties that can now be imparted to the material are of special importance to such cushioning markets as aircraft and transportation seating and the hotel and institutional field.

Natsyn-Budene Plant Planned by Goodyear

Goodyear Tire & Rubber Co., Akron, O., recently revealed that it will build a new multi-million dollar plant in Beaumont, Tex., for the production of two synthetic natural type rubbers. The plant will be located within several miles of Mobil Oil Co.'s Beaumont refinery, from which Goodyear will obtain its principal raw materials.

The two rubbers to be produced are Natsyn, made from isoprene, and Budene, made from butadiene. Natsyn is said to have a physical structure which duplicates the natural rubber molecule and can be used both as an extender and a replacement for natural rubber.

Budene synthetic rubber is an extender for natural rubber and is said to have many outstanding applications. Both rubbers will be used in tires, in industrial products such as conveyor belts, and in other products requiring their properties.

To date, Budene and Natsyn have been produced in limited quantities in pilot plants in Akron. The Beaumont plant will be the company's first production operation engineered for commercial output.

No capacities were given for the new unit, but sources estimated the cost of the new facility at $20 million.

Scale model of Goodyear's new Natsyn-Budene plant is examined by Russell DeYoung, company president, and Sam DuPree, vice president in charge of production

Industry News

High Costs Force Gutta Percha To Fold

Gutta Percha & Rubber Ltd., a 77-year-old Toronto, Ont., Canada, firm, recently announced its voluntary liquidation. Loss of export markets and lack of tariff protection as well as the rising cost of manufacturing and salaries and wages made it impossible for the firm to earn any profits for the past two years, reported M. O. Simpson, Jr., chairman of the board of directors.

A staff of 365—only a fifth of the peak staff of the 1940's—were put out of work by the liquidation. During the 1920's the firm employed 1,300 men producing tires, mechanical rubber goods, footwear, and auto accessories. The production of automobile and truck tires was abandoned in 1948. In 1950 the business was acquired by Combined Enterprises, Ltd., and in July of that year the footwear division was closed down.

The Gutta Percha plant has been sold to the Ayer storage group of companies for approximately $750,000, to be used for manufacturing and warehouse purposes.

Seiberling Rubber Co. of Canada, Ltd., Toronto, reported recently that it had purchased the tread rubber business of Gutta Percha. The purchase includes all equipment, formulas, trade marks, inventories, and accounts receivable pertaining to Gutta Percha's tread rubber business. Seiberling said that it would continue manufacture of tread rubber under the Gutta Percha "Duratread" formula.

Cary PVC Expansion

Cary Chemicals, Inc., New Brunswick, N. J., producer of vinyl resins, compounds, and copolymers and synthetic waxes, at a press conference on April 27 announced that its Flemington, N. J., plant is now on stream to provide a minimum of 50 million pounds of poly(vinyl chloride) homopolymer and copolymer resins annually. In addition to more than tripling its resin producing capacity to meet increased demand, Cary has also expanded its compounding facilities at its New Brunswick plant to provide for a minimum of 36 million pounds of compounds annually.

New pilot plants are now in operation at both plant locations which will permit intensified product development for Cary Blacar products, reported George F. Blasius, company president. All departments of the company including manufacturing, research and development, sales, financing, and warehousing facilities have been extensively expanded.

Members of the press and other guests enjoyed cocktails and a smorgasbord prior to listening to an address given by Robert B. Meyner, governor of New Jersey. Meyner, who was introduced by Blasius, commented on the growth and importance of the chemical industry of New Jersey as to how it affects both the national economy and the residents of New Jersey. Following the addresses, guests were conducted on a plant tour of the Flemington facilities.

Borden/U.S. Rubber Form Monochem, Inc.

A program for the construction of a $50-million complex of chemical plants to convert hydrocarbons into more than a dozen chemical products was recently announced by The Borden Co. and United States Rubber Co., both of New York, N. Y.

The two companies are forming a jointly owned chemical company to be called Monochem, Inc., which would erect a major chemical manufacturing unit using hydrocarbons as the starting point for the production of acetylene and vinyl chloride monomer. Tentative plans call for both companies to erect adjacent individually owned plants which will use the Monochem output as intermediates for other products.

The companies have optioned several industrial sites in Louisiana and in Texas. Other locations are under consideration.

The Monochem plant, on which construction will start later this year, initially will have the capacity to produce more than 80 million pounds of acetylene and approximately 150 million pounds of vinyl chloride monomer yearly. The major initial use of this output would be the manufacture of vinyl plastic resins which Borden makes at Leominster, Mass., and U. S. Rubber makes in Painesville, O.

Final site selection will be based on the accessibility of basic chlorine supplies, ample land for long-range expansion, and marine loading facilities. The new plant is expected to be completed in 1962.

GE Ups Silicone Output

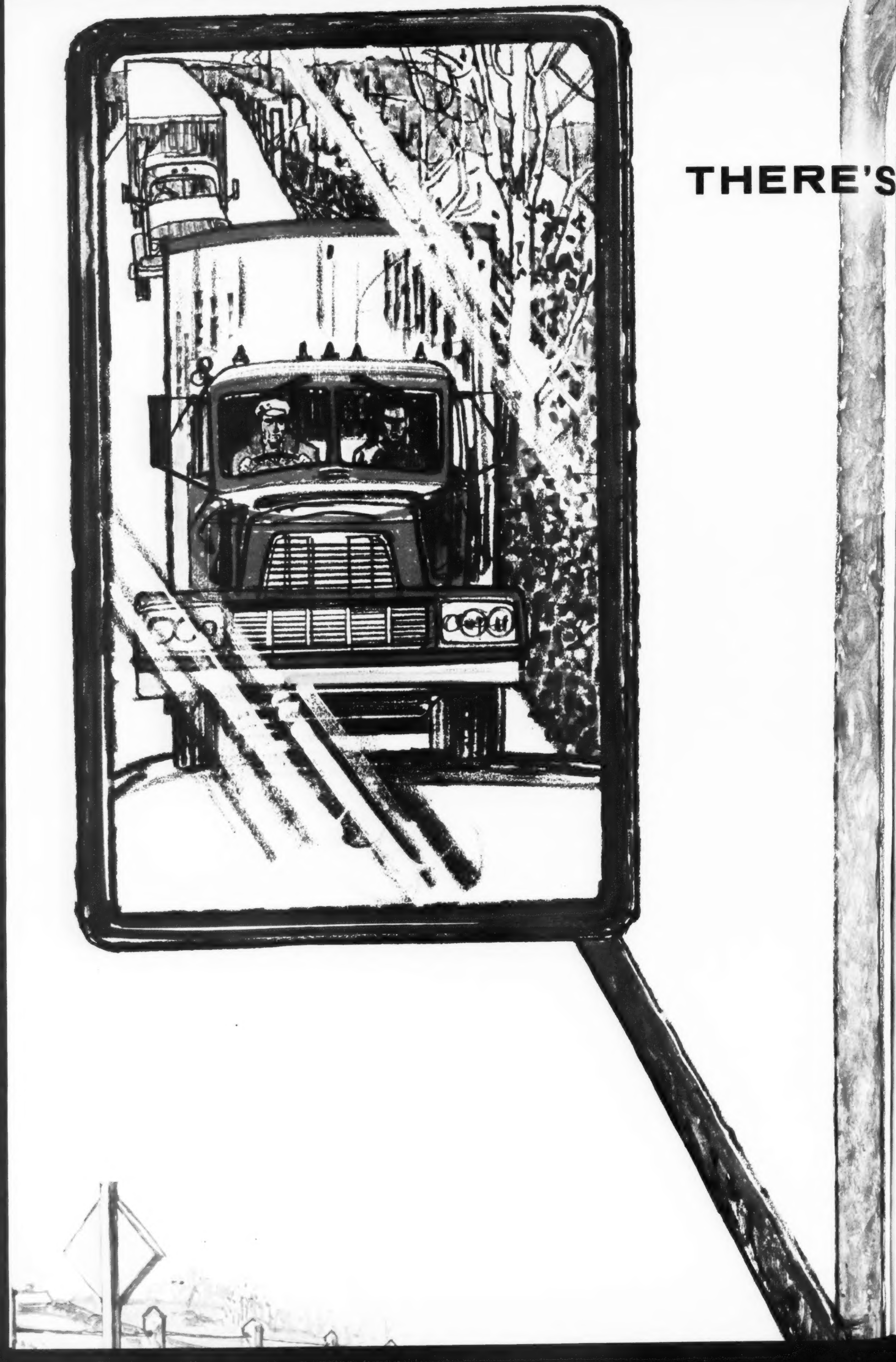
An expansion program aimed at boosting silicone materials' production capacity to 1963 demand levels is now under way in General Electric Co.'s silicone products department, Waterford, N. Y. The program, covering the next two years, will involve an outlay of several million dollars in new buildings, equipment, and processes, according to Jerome T. Coe, department general manager.

The initial phase of the program is construction of a manufacturing facility for silicone fluids, dispersions, emulsions, and specialty products which will add 15,000 square feet to existing facilities. This phase, now under construction, is slated for completion in October of this year. The remainder of the expansion program will involve the addition of processes and facilities still in the planning stages.

The new facilities will directly serve the growing markets for anti-foam ingredients, paper release agents, high-temperature silicone lubricating greases, silicone fluids for waxes and polishes, and room-temperature vulcanizing liquid silicone rubbers for wire and cable and other electrical uses. The program also anticipates a growing demand for new silicone applications in the missile, aircraft, textile, and building industries.

The fluids building will increase the plant's number of manufacturing buildings to seven and the plant's total facilities to 15 major buildings. The plant is a completely integrated production unit for manufacturing silicone products.

Exterior view of Cary Chemicals expanded poly(vinyl chloride) plant



THERE'S T

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Technical Service Lab Opened by UCC

Union Carbide Chemicals Co., division of Union Carbide Corp., is now operating a new technical service laboratory near Tarrytown, N. Y., in Westchester County. The laboratory is designed to aid in the development and the improvement of the products of Carbide's customers. The unit has five main functions: (1) It provides specialists to investigate customer problems. (2) It provides basic application knowledge to customers in various industries and permits evaluation of new products of potential interest to these customers. (3) It provides the customer with engineering data on the handling, storage, and processing of purchased chemicals. (4) It provides information to Union Carbide's research and development departments to aid them in developing new products. (5) It provides facilities for training technical sales personnel.

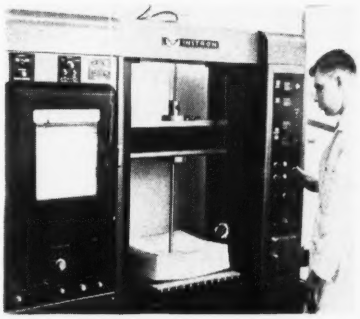
"An increased service effort is required to support sales of chemicals in areas undergoing rapid or significant changes," J. A. Field, vice president-marketing, told guests at the opening of the laboratory on May 11. Customer needs may be defined only by offering complete test data and service backup. UCC's use-research programs are creative and, as such, are designed to expand and diversify the use of chemicals, he said.

The scope of activities in this modern facility is broad and varied to provide the information needed for the company's more than 400 synthetic organic chemicals and the many end-uses into which they go. Typical of the 29 major industry groups in which work is under way at the laboratory are: automotive, petroleum, aerosol propellants, refrigerants, textiles, plasticizers, water-soluble chemicals, detergents, gas purification, and surface coatings.

Of interest to readers of RUBBER WORLD is the laboratory's development of improved polyurethane foams for cushioning and insulation based on polyethers. Carbide scientists are determining how different raw materials, catalysts, and processing conditions contribute to better quality and lower cost polyether foams.

The laboratory building accommodates about 100 scientists with a supporting staff of 50 people under the direction of A. B. Steele. The main portion is a three-story stainless-steel and glass building. It is 300 feet long and 60 feet wide. About one-third of the building is devoted to administrative offices and public areas. The remainder is divided into 46 laboratories with 33 adjacent offices.

The technical service laboratory is designed to be flexible in its experimental activities to keep pace with changing technology and customer requirements. It is equipped with the latest in analytical and evaluation equipment to investigate chemical products used in all chemical process industries.



Compression strength of polyether-based urethane foam sample is determined at Union Carbide Chemical's new technical service laboratory

Huber To Make More ISAF/FEF/GPF Blacks

J. M. Huber Corp.'s carbon black division is currently expanding carbon black capacity of its plant at Eldon (Baytown), Tex., to produce 60 million additional pounds a year, according to Michael W. Huber, president. Two units are under construction—one for ISAF (intermediate super abrasion furnace black), and the other for producing FEF (fast extruding furnace black) and GPF (general-purpose furnace black). The estimated completion date for the ISAF unit is December 1, 1960; and January 1, 1961, for the other unit.

Huber has carbon black manufacturing facilities at both Borger and Baytown, Tex. The current increase in facilities is the fourth in a series of expansions in recent years. All of the major grades of channel and furnace blacks are produced at these two locations.

Huber also manufactures silica-type pigments, and printing inks and produces kaolin clays for the rubber and other industries. The company has more than 1,100 producing oil and gas wells in the Southwest and manufactures oil-field production equipment.

Swiss Group Controls Rubber Firm Here

A Swiss group led by Oerlikon-Buehrle, a manufacturer of machine tools, has acquired controlling stock in the Rubber Corp. of America, Hicksville, N. Y., according to William A. Merton, president of the corporation. Plans call for the expansion of the rubber company to meet the increased activities resulting from close cooperation with the Swiss group.

Oerlikon, which has worldwide interests in many fields, has a strong interest in Dynamit A.G., Troisdorf, Germany, a leading manufacturer of plastic raw materials and products. It is expected that the technical backing by Dynamit A.G. will be made available to Rubber Corp. through the Swiss group.

Mr. Merton also pointed out that the importation of natural rubber latex, as well as the South American import and export business conducted by the Corporation will be handled by Merton Trading Co., Inc., headquartering in Meadow Brook National Bank Bldg., Hicksville. Richard G. Merton, who is a director of Rubber Corp., has been elected president of this newly formed trading company.

Management and personnel of Rubber Corp. of America will remain unchanged, except for those members of the staff who have joined Merton Trading Co.

Armstrong To Build West Coast Tire Plant

The Armstrong Rubber Co., West Haven, Conn., recently announced plans for a new \$25-million tire producing plant to be built in Hanford, Calif. The proposed one-million-square-foot plant will be located on 320 acres in Hanford—almost equidistant between Los Angeles and San Francisco.

Except for the section set aside for raw material and finished goods storage, the plant will be a one-story structure equipped with the latest tire building, fabric processing and automatic curing equipment, reported Frederick Machlin, company president. With a production capacity of 10,000 tires daily, the new plant will employ 1,000 workers with employment expected eventually to reach 1,600.

The site chosen by Armstrong, south of Hanford's business district, is conveniently located on rail and highway routes and contains excellent sources of water. Construction will begin soon, with completion scheduled for late 1961.

At present, major expansion of Armstrong, totaling more than \$10 million is taking place at the firm's four plant locations, in West Haven and Norwalk, Conn., Des Moines, Iowa, and Natchez, Miss. In addition, the company has an affiliated synthetic rubber plant, Copolymer Rubber & Chemical Corp., in Baton Rouge, La., and maintains a large tire test fleet in San Antonio, Tex.

Armstrong's present tire producing capacity of 40,000 tires and tubes daily is sold primarily to the replacement tire market through 1,500 independent distributors throughout the country.

Escon Polypropylene Baytown Unit On Stream

A process for the production of polypropylene was announced on May 9 by Esso Research & Engineering Co., Linden, N. J., preceding the formal dedication on May 10 of a plant at Baytown, Tex., to produce initially 40 million pounds a year of the versatile new plastic. The plant was built and will be operated by Humble Oil & Refining Co., Houston, Tex.

At Linden, Charles L. Fleming, Jr., Esso Research vice president in charge of chemical projects, said that the parent firm, Standard Oil Co. (New Jersey), spent $15 million on research and development of the polypropylene process. Total cost of the Jersey venture, including the Humble plant at its Baytown Refinery, was $30 million. Dr. Fleming pointed out that in addition to the continuous operation feature of the process, a key aspect is an improved catalyst invented by Esso.

Key speaker at the Baytown ceremonies was William Naden, executive vice president and a director of Humble, who pointed out that the new ultra-modern polyolefin unit marks the full-scale entry of Humble and its parent company, Jersey Standard, into a new phase of the petrochemical industry.

The Humble plant culminates a three-year master plan that began with basic research on catalysts and chemical reactions. The plant has basic facilities to allow later expansion of production to 100 million pounds of polypropylene a year. The petroleum-based plastic is extruded, pelletized, and packaged in 50-pound bags for shipment to product manufacturers. The pellets are being marketed as 'Escon' and sold through Enjay Chemical Co., New York, N. Y., which on May 31 became a division of Humble Oil & Refining Co. The plastic is offered at three process levels—1.5, 3.5, and 5.5 melt index, measured at 230° C.

Escon molded and extruded products are reported to possess high tensile and impact strength, abrasion resistance, exceptional stiffness and surface values despite the fact that polypropylene is the lightest of all thermoplastic resins. Also, the high softening point, coupled with low water absorption, permits steam sterilization of fabricated materials. Escon resins may be fabricated by such techniques as injection molding, flat film extrusions, sheeting, and thermoforming. For textiles and ropes, Escon has high tensile strength, good knot strength and resilience, low density, good abrasion resistance, and immunity to attack by fungus, moths, and marine organisms. Ropes of Escon monofilaments maintain flexing durability to temperatures as low as —70° F.

Humble officials noted that Enjay Laboratories in New Jersey operate a customer service and market development program which will help polypropylene customers develop new products and improve the quality of existing ones.

Hot Escon polypropylene is examined as it flows from extruder. The strings of plastic will be cooled and chopped into small pellets for packaging and shipping

Presray Renovates Its Pawling Plant

The Presray Corp., fabricator of pneumatic handling and sealing systems and a subsidiary of Pawling Rubber Corp., Pawling, N. Y., recently completed the renovation of its new modern Pawling plant. At the same time, Presray's president, Howard W. Smith, reported that the board of directors had appointed L. P. Hollander vice president in charge of engineering and manufacturing, and R. A. Schroth as vice president in charge of sales.

The new plant features a completely new quality-control area, modern testing equipment, and the latest production, lighting, and other manufacturing equipment.

Presray fabricates a patented materials-handling device called the Pneuma-Grip, and an air-operated seal called the Pneuma-Seal. Another development which will be expanded in the new plant is the use of a new radiation-resistant compound for critical sealing applications where a high magnitude of radiation exists.

Salesmen's Auto Mileage up in 1960

Traveling salesmen in the rubber industry are driving farther in 1960 to make their sales than they did in 1959, according to A. J. Schoen, president of Wheels, Inc., Chicago, Ill., a leading auto fleet leasing firm.

Average mileage for rubber salesmen driving autos on company business rose to 1,881 miles per month for the first four months of 1960, compared to a monthly average of 1,813 miles for the same period of 1959. Monthly mileage comparisons for the first four months of this and last year were as follows: (1959) 1,822, 1,660, 1,823, and 1,854, against (1960) 1,999, 1,848, 1,996 and 2,083.

The 12-month average for the rubber industry for 1959 was 20,000 miles, Schoen said. Projected average for 1960 is approximately 21,500 miles. Annual averages reflect the much lower mileages traveled for business in summer months during the vacation period and the sharp drop in driving by salesmen immediately before and after Christmas.

Increased competition for sales is the major reason for the upsurge in miles in 1960, declared Schoen. Salesmen report that their customers are tougher on price, are making increased demands for speedier deliveries, and are more exacting as to the quality of the merchandise they order.

Dayco Licenses Citla And Roulunds Fabriker

Dayton Rubber International, a division of Dayco Corp., Dayton, O., in keeping with its policy of licensing international firms to make and sell Dayton products in their own markets, recently completed licensing agreements with Citla, S.A., a Mexican firm, and Roulunds Fabriker, Ltd., of Denmark.

DR International has completed a long-term technical assistance and licensing agreement with Citla, S.A., of Mexico City, a manufacturer of automotive and industrial belts. Citla will now make automotive raw-edge V-belts under the Dayton brand. DR International also has acquired an interest in the Mexican firm. Dayco's extensive dealer organization in Mexico will not be changed by the agreement, except that it will now have industrial belts added to the line.

DR International has also licensed Roulunds Fabriker, Ltd., Odense, Denmark, to make the complete line of Dayton V-belts and related products for sale to "Outer Seven" countries. The products will carry the Dayton/Roulunds brand and will be marketed in Norway, Denmark, Sweden, Austria, Portugal, Switzerland, and Great Britain as well as Finland and Iceland.

DR International signed a similar agreement last year with a Dutch firm known popularly as "Hevea." A new joint company, called Dayton-Hevea, was formed to sell these products in Europe's Common Market.

Committee D-11 Assigns Two New SBR Numbers

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials through Subcommittee 13 on Synthetic Elastomers has assigned numbers to new styrene-butadiene elastomers, 1809 and 1810, both requested by Goodrich-Gulf Chemicals, Inc.

DESCRIPTION OF TYPES OF STYRENE-BUTADIENE (SBR) ELASTOMERS—ASSIGNMENT OF NEW CODE NUMBERS—ASTM D-11 1419-56T

Number as assigned	1809	1810
Date assigned	4/10/60	4/10/60
Requested by	Goodrich-Gulf Chemicals, Inc.	Goodrich-Gulf Chemicals, Inc.
Distinctive feature	HAF black-37.5 phr. oil	FEF black-50 phr. oil
Close previous number, if any	4750	4751
Type	1800	1800
Nominal temp., °F.	43	43
Activator	FRA	FRA
Shortstop	ND	ND
Catalyst	OHP	OHP
Antioxidant	ST	NST
Emulsifier	Mixed	FA
Nominal bound styrene, %	23.5	23.5
Conversion, %	60	60
Mooney viscosity ML 1+4 (212°F.—polymer)	—	—
Compound	53	50
Coagulation	Acid	Acid
Carbon black type	HAF	FEF
Phr.	75	100
Oil type	HI-AR	NAPH
Phr.	37.5	50
Finishing	Normal	Normal

Note: Abbreviations and symbols are defined as follows:
FRA=free radical type, i.e., iron-pyrophosphate, peroxamine sulfoxylate
FEF=fast extrusion furnace
FA=fatty acid
HAF=high abrasion furnace
HI-AR=highly aromatic
OHP=organic hydroperoxide
ND=non-discoloring
NST=non-staining
NAPH=naphthenic
ST=staining

Rubber Parts Exhibit At 1960 Auto Show

A rubber industry exhibit highlighting all automotive rubber parts and accessories that contribute to the safety, convenience, and economy of the modern passenger automobile will be one of the important sections of the 1960 National Automobile Show to be held in Detroit's new Cobo Hall by the Automobile Manufacturers Association from October 12 through 23.

The board of directors of The Rubber Manufacturers Association, Inc., approved industry participation in this show by the AMA which will unveil its entire line of 1961 models. The theme of the show is "Wheels of Freedom."

The AMA's special Auto Show Committee has conceived of "Auto Wonderland" as a show within a show, and the first section will pick up the birth of a new model from clay to mock-up, and carry it through engineering, development, and production, with full emphasis on the key research that goes into making the motor vehicle of the Sixties the precision instrument of work and pleasure it is today.

The second section of this show will deal with raw materials and components and will portray the important role of supporting industries in the manufacture of a modern automotive vehicle. The first phase of this section will cover ferrous and non-ferrous metals, glass, chemicals, plastics, textiles, leather, plating, paints, and petroleum, with rubber serving as the transitional bridge from raw materials to finished components.

The third and final section of "Auto Wonderland" will be devoted to displays underlining the social and economic impact of the automotive industries on family life, community growth patterns, and overall economy.

Extensive news, TV, radio and magazine coverage is scheduled for the entire show.

Seven U. S. Libraries Get Natta's Papers

A limited edition of the collected papers of Professor Giulio Natta and his associates at the Polytechnic Institute of Milan, Italy, has been made available to seven leading technical libraries in the United States.

Comprising 145 technical articles published since 1954 on the subject of stereospecific catalysis and stereoregular polymers—the field in which Natta is the acknowledged pioneer—the collection has been presented to Professor Herman Mark for the chemistry library at Polytechnic Institute of Brooklyn; Professor Arthur Tobolsky for the chemistry library at Princeton University; Dr. Hilary Koprowski for the New York Academy of Science, of which Professor Natta is a fellow; Professor Paul Flory, of the Mellon Institute in Pittsburgh; the American Chemical Society in Washington, D. C.; the New York Chemists Club; and the John Crerar Library in Chicago.

Presentation of the Natta volumes to the Polytechnic Institute of Brooklyn and Princeton University were made on behalf of Professor Natta by Lucio Lucini, president of Novamont Corp., the recently established United States subsidiary of Montecatini, the Italian chemical firm which has sponsored much of Natta's research. The chemistry libraries of both Brooklyn Polytechnic and Princeton were also recipients of a gift from Novamont of 100 shares of Montecatini stock.

Rubber Symposium

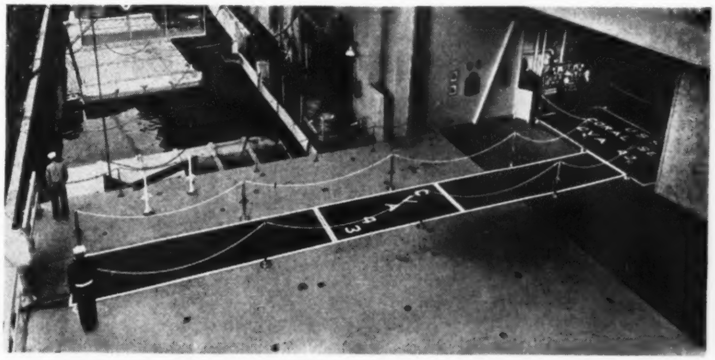
(*Continued from page 115*)

"Silicone Rubber Compounding." P. C. Servais, Dow Corning Corp.; and I. H. Riley, Midland Silicones, Ltd.

"Modern Nitrile Rubber Technology." H. A. Pfisterer and I. W. E. Harris, Polymer Corp., Ltd.

"The Chemistry and Vulcanization of 'Viton' Fluoroelastomers." G. T. Perkins and J. F. Smith, E. I. du Pont de Nemours & Co., Inc.

"Elastomers for Advanced Design Flight Vehicles." R. E. Headrick, Wright Air Development Center.



Pawling Rubber Corp.'s Parco Triple A vinyl links recently were woven into a reception mat for the U. S. Aircraft Carrier USS *Coral Sea*. Visitors to the carrier step from the gang plank on to a runner 53 feet long and 6 feet wide. At the end of the runner is the master panel 18.5 feet long by 14 feet wide. The mat was woven by Griffith Rubber Mills, which is the West Coast licensee of Pawling Rubber Corp., from links that were made by the latter company

NEWS BRIEFS

TITANIUM PIGMENT CORP., New York, N. Y., is opening a Baltimore sales office to offer greater service to industries in the eastern sections of Maryland and Virginia, which will be supervised by Wyatt Schoonmaker, Middle Atlantic district sales manager, formerly of the Philadelphia sales office. The Philadelphia office will remain at its present location and will continue to operate as a branch office of the eastern district under the supervision of Allan G. Davies, eastern district sales manager, who headquarters in New York. Dennis L. Tabisz joins E. C. Wood as a member of the Philadelphia sales staff.

DEWEY & ALMY CHEMICAL DIVISION, W. R. Grace & Co., Cambridge, Mass., recently expanded by 20% its manufacturing capacity for its "Daxad" dispersing agents. The new equipment, added to the existing "Daxad" facilities of the division's Cambridge headquarters plant, was planned to fulfill the steadily increasing requirements of the rubber, paper, paint, textile, and leather tanning industries.

ELECTRONICS & INSTRUMENTATION DIVISION, Baldwin-Lima-Hamilton Corp., Philadelphia, Pa., transferred its testing machine product line to the Wiedemann Machine Co., Gulph and Long Roads, King of Prussia, Pa., effective May 9. This transfer covers the physical testing machine business only and does not include the Baldwin SR-4 strain gages, transducers, and related instrumentation. Wiedemann Machine Co. will proceed with the testing machine business, using the services of all key sales, engineering, and service personnel associated with BLH's testing machine activity at the time of transfer.

THE PIGMENT & CHEMICAL CO., LTD., has moved its Toronto, Ont., Canada, sales office to its own building at 162 Wicksteed Ave., Leaside, Toronto 17. Telephone number is HU-5-7628. The new offices provide increased space, and the building property offers additional room for expansion of storage facilities. Administrative functions will continue to be carried out at the Montreal, P.Q., head office.

UNITED STATES RUBBER CO.'S Mishawaka, Ind., plant has developed a roof coating that combines butyl rubber and aluminum to extend the life of asphalt roofs as much as 15 years. Tests indicate that asphalt shingle roofs treated with the material will last for 10 to 15 years before needing further attention. Colors are formulated with aluminum pigments in a butyl rubber base, improving the old roof's ability to reflect heat by 15%. Also, it is claimed, the coating is waterproof, will not chip, crack, or peel, and the colors are fade resistant. The company plans to market the material under its own name of U. S. Royal Roof Coating, and to package it for leading distributors who wish to market it under their own brand names.

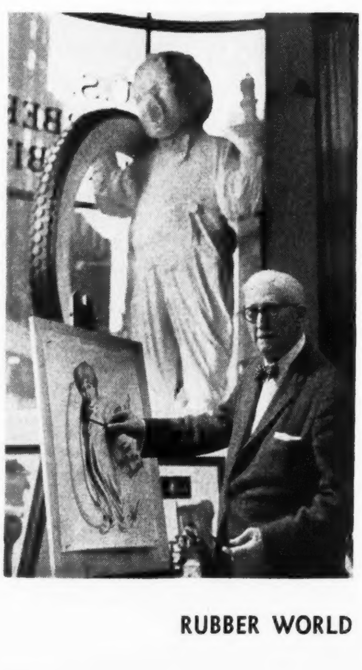
STILLMAN RUBBER CO., Culver City, Calif., has announced the availability of O-rings in compliance with MILR-25897C. These new O-rings are made from Stillman Compound SR 277-70, a "Viton" formulation which was developed to meet unusual conditions of extreme heat (—65 F. to more than 600° F.) and hard-to-handle fluids such as solvents, fuels, lubricants, hydraulic fluids, acids, and bases. Stillman is offering a complete line of O-rings in standard sizes on a fast delivery basis.

SCRAP RUBBER & PLASTICS INSTITUTE, a division of the National Association of Waste Material Dealers, Inc., New York, N. Y., has appointed the following members to the executive committee of the Institute: Harry Alpert, J. Solotken & Co., Inc., Indianapolis, Ind.; Hy Helbein, Southern Metals Co., Inc., Charlotte, N. C.; Milton Kuskin, A. Schulman, Inc., East St. Louis, Ill.; Sherrard Nott, Frank H. Nott, Inc., Richmond, Va.; Charles E. Rashner, McMahon Iron & Metal Co., Bronx, N. Y.; Henry M. Rose, H. Muehlstein & Co., Inc., Akron, O.; Joseph M. Viener, Hyman Viener & Sons, Washington, D. C.; Sol Walker, Sol Walker & Co., Tampa, Fla. The announcement, made by Ben Gordon, A. Schulman Inc., Akron, and president of the Institute, reported that Mr. Gordon was enlarging the executive committee and giving it wider national representation as a step in broadening the Institute's programs.

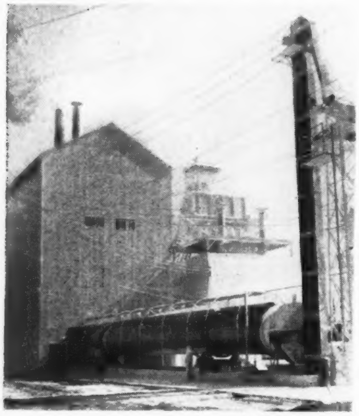
ENJAY CO., INC., New York, N. Y., has become Enjay Chemical Co., a division of Humble Oil & Refining Co., Houston, Tex., effective May 31. The division will be directly responsible for both the marketing and the coordination of Humble's chemical products activities throughout the United States. Also, Enjay will sell chemicals to Esso Export Corp. for distribution to foreign markets. Enjay will headquarter in New York, with offices in Akron, Boston, Charlotte, Chicago, Detroit, Los Angeles, New Orleans, and Tulsa. J. E. Wood, III, former president of Enjay Co., Inc., has been appointed president of Enjay Chemical Co.

NIAGARA BRAND CHEMICALS, Burlington, Ont., Canada, has opened a plant to produce rubber-makers sulfur. To house the special machinery a 5,400-square-foot extension has been added to the company's present Burlington plant. Sulfur from Canadian sources will be processed by the company in this new operation for consumption by Canadian customers.

Burr E. Giffen, 74-year-old originator of the Fisk Tire boy and the "Time To Re-Tire" slogan, recreates his original sketch in the United States Rubber Co.'s exhibit hall in Rockefeller Center, New York, N. Y. In the background is a nine-foot statue of the world-famous trade mark. The Fisk boy was copyrighted on June 1, 1910, and registered as a trade mark on July 21, 1914. The original "Red Top" tire is being revived as the tire portion of the trade mark.



News Briefs



This new Nichols Herreschoff calcining furnace is now in full production at the Sandersville, Ga., operations of Burgess Pigment Co., producer of hydrous and anhydrous aluminum silicate pigments and kaolin clays. This additional facility will more than double the company's production capacity, enabling it better to serve the rubber and plastics industries

RIPPLE SOLE CORP., Detroit, Mich., won a recent law suit against a retail chain importing shoes from Japan, utilizing soles determined to infringe upon patents of Ripple Sole. A decree was entered by the High Court of Australia in favor of Ripple Sole. Damages and costs were awarded Ripple in addition to the injunction, which forbids further infringement during the life of the original patent or any extension thereof. Roy Johnston, Ripple Sole licensee for Australia, supervised the handling of the case, and was advised by Nathan Hack, inventor of the Ripple sole and chairman of the board of Ripple Sole Corp., during his recent visit to Australia.

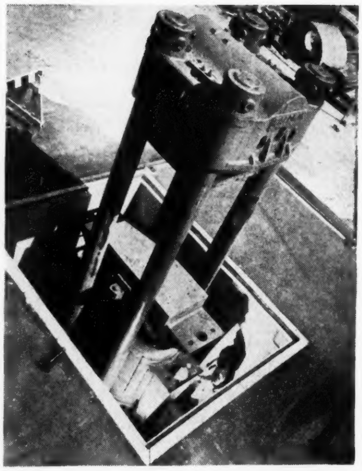
SIGNAL OIL & GAS CO., Houston, division, Houston, Tex., reports its new company name, as the result of a merger between Eastern States Petroleum & Chemical Corp. and Signal Oil & Gas Co., effective September, 1959. The name, Eastern States Petroleum & Chemical, is to be discontinued. R. N. Blaize, who was president of the former Eastern States firm, will continue as head of the Houston division as vice president and a director of Signal. Petrochemicals manufactured by the Houston division will continue to be marketed under the Espesol brand. The firm's business will continue to be operated through the various divisional offices located at Chicago, Cleveland, Louisville, Atlanta, New York, and Los Angeles.

UNITED STATES PATENT NO. 2,933,469 was granted to Harlan A. Depew in April and consists of a process for preparing stable mixed dispersions of elastomers with volatile water-immisible organic liquids containing destabilizing components and products therefrom. The improvement in the process involves preparation of an aqueous emulsion of vulcanizing agents by first dispersing these ingredients in a liquid hydrocarbon with a boiling point between 25 and 300° C. and then adding water to the hydrocarbon dispersion to form an emulsion. The aqueous emulsion of the vulcanizing agents is then added to the rubber latex. Since there is no contact between the particles of rubber and the curatives, the dispersion remains stable until the emulsion is broken. Stable mixtures of ammoniacal natural rubber latex containing zinc oxide and neoprene latex containing magnesia are thus possible.

B. F. GOODRICH CANADA, LTD., Kitchener, Ont., has sold Koroflex Plastics, Ltd., Brampton, Ont., which manufactures rain and winter plastic footwear, to Mailman Corp., Ltd., Montreal, P.Q., Canada. Current employment at the Brampton plant is about 70. The transaction was announced jointly by R. V. Yohe, president of Goodrich Canada, and A. S. McLean, president of British Rubber Co., Ltd., a Mailman-owned company.

A retirement party was given Arch Mease by 54 of his friends, customers, competitors, and fellow Du Ponters on April 27 in Los Angeles, Calif.[1] Arch, who has been with Du Pont for 43 years, was western district manager of the elastomer chemicals department since 1946. He was given a number of conventional gifts such as a watch and a plaque, as well as a donkey

[1] RUBBER WORLD, May, 1960, p. 106.

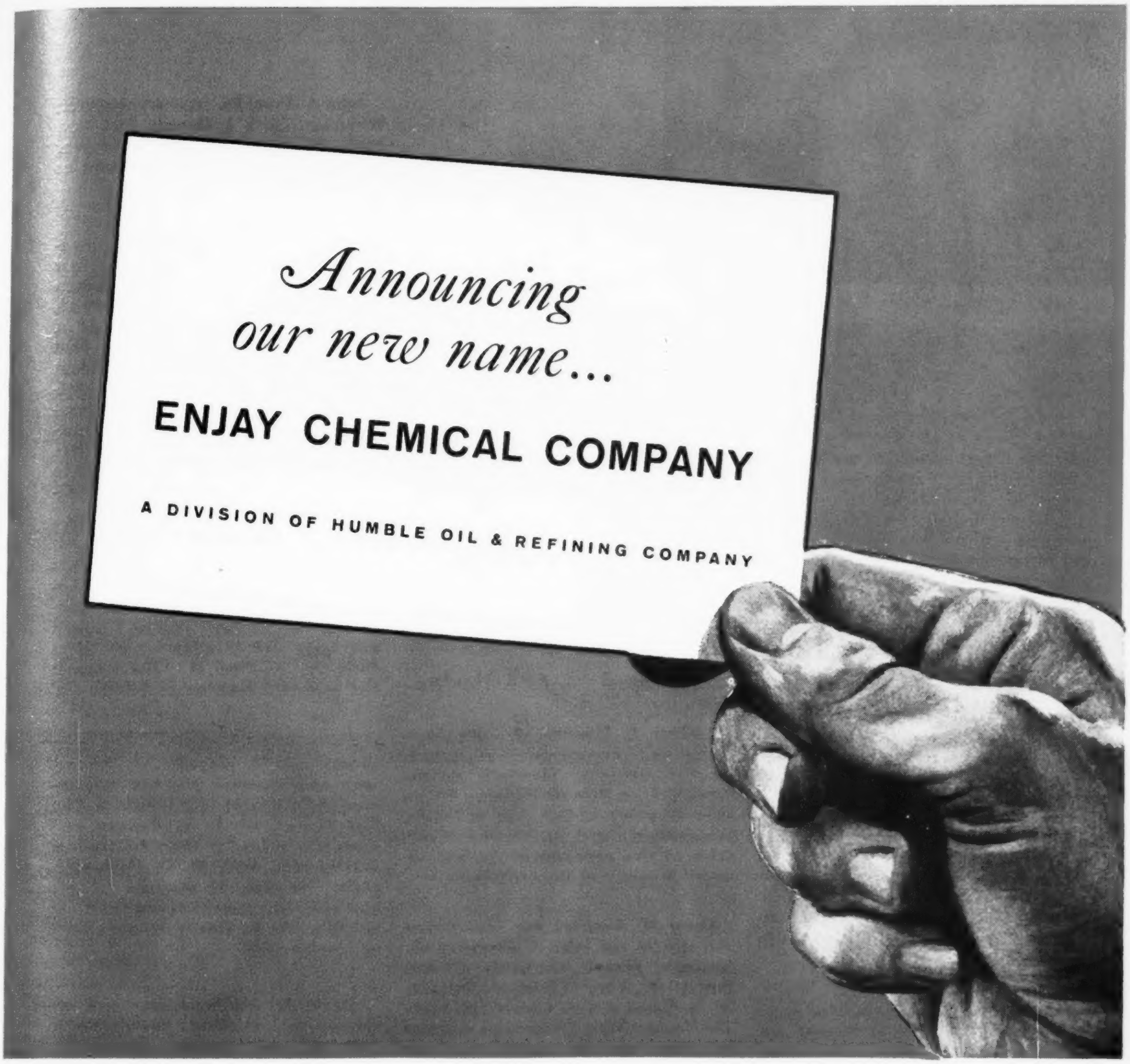


This 2,000-ton hydraulic press is the largest which has been installed in the Houston, Tex., plant of Wyatt Industries, Inc. The press was installed in the open, after which the shop was enlarged to cover it. The press will permit additional participation in the missile program, as well as provide parts for industry. Wyatt's plastics and rubber division is contributing parts for the Bomarc, the Pershing, and the Minuteman space vehicles

ALLIED CHEMICAL CORP., New York, N. Y., recently announced a major research expansion which will more than double the laboratory facilities of its General Chemical division near Morristown, N. J. Construction was started in May and is expected to be completed late next year. With this additional space almost 500 research scientists and supporting staffs will eventually be accommodated. Stepped-up research by the division on fluorine polymers, thermally stable fluids, and refractory metals, along with consolidation of technical services and petrochemical research groups dictates the expansion at this time, reported Frank J. French, division president.

EBERHARD FABER, INC., is the new name of the former Eberhard Faber Pencil Co., Wilkes-Barre, Pa. The change was made as part of a program designed to allow for expansion and diversification.

HARWICK STANDARD CHEMICAL CO. OF CALIFORNIA, formerly at 1248 Wholesale St., Los Angeles 21, Calif., has moved to 7225 Paramount Blvd., Pico Rivera, Calif.



Effective May 31st, the name of Enjay Company, Inc. changed to Enjay Chemical Company, a division of Humble Oil & Refining Company. Enjay Chemical Company will continue to serve modern industry with a complete line of petrochemicals, including Butyl rubber, solvents, resins, plastics, and additive compounds for fuels and lubricants. As a division of Humble Oil & Refining Company, the company is determined to become even more important in the growing petrochemical field.

As the pioneer in petrochemicals, and a leader in the marketing of chemical raw materials, it has always been the policy of Enjay to help customers develop new products and improve existing ones. Enjay now has ten sales offices — including the new one recently added at Houston, Texas — standing ready to offer immediate handling of product orders and requests for technical service. Strategically located distribution points also offer benefits of prompt deliveries.

Enjay Chemical Company looks forward to giving its thousands of customers continued and unequalled technical service . . . backed by one of the world's largest research organizations.

HOME OFFICE:
15 West 51st Street, New York 19, N. Y.

OTHER OFFICES:

Akron	*Boston*	*Charlotte*
Chicago	*Detroit*	*Houston*
Los Angeles	*New Orleans*	*Tulsa*

ENJAY
PETROCHEMICALS

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

NEWS about PEOPLE

Henry C. Speel has joined Universal Oil Products Co., Des Plaines, Ill., and will have charge of market research activities of the chemical products development department. Speel has a record of 30 years in the chemical industry, most recently as a partner in the chemical consulting firm of Schwarz, Speel & Associates.

James R. Dudley, vice president of research and development, The Richardson Co., Melrose Park, Ill., has been elected president of the Commercial Development Association, a group of managers in charge of market research and development in the chemical and chemical processing industries.

J. G. Edmiston has been appointed regional sales manager—chemicals, with headquarters in the Monsanto Canada, Ltd., Toronto, Ont., office. His new assignment will be in addition to his previous position as product sales manager for rubber chemicals.

Rolf J. Fialla, who was resident technical service manager in Europe for Columbian Carbon Co., is now a vice president of Columbian Carbon International, Inc., New York, N. Y. Dr. Fialla will be responsible for sales and technical service throughout continental Europe including the new carbon black production facilities in Holland and Italy, and he will continue to act as a liaison between European customers and Columbian Carbon Co.'s facilities in the United States.

Robert A. Grief is now a sales representative for Conneaut Rubber & Plastics Co., Conneaut, O. He was formerly a sales representative for Samuel Moore & Co.

John Sabot has been appointed coordinator of manufacturing operations, Goodrich-Gulf Chemicals, Inc., Cleveland, O. He joined Goodrich-Gulf as project manager in 1956.

Louis Moretti is now factory manager of the United States Rubber Co. plant at Passaic, N. J. He was formerly a general superintendent at the plant.

H. C. Speel

A. J. Hawkins

Andrew J. Hawkins, Jr., has been named sales manager, western district, for the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. He will have headquarters in Los Angeles, Calif. Prior to this appointment he was assistant manager at the department.

Oscar W. Kaalstad has been named manager of the sales development department, organic chemicals division, Dewey & Almy Chemical Division, W. R. Grace & Co., Cambridge, Mass. The former West Coast sales manager will now supervise sales of emulsions and latices to rubber and other industries.

Anton Vittone, Jr., becomes general manager of plants, B. F. Goodrich Chemical Co., Cleveland, O., and will be responsible for all the company's production facilities, product improvement, and cost control. **R. J. Wolf** succeeds him as director of development responsible for all operations of the firm's development center at Avon Lake, O.

John A. Franklin, secretary-treasurer, Whittaker, Clark & Daniels, Inc., New York, N. Y., marks his fiftieth year with the company which he joined as an office boy.

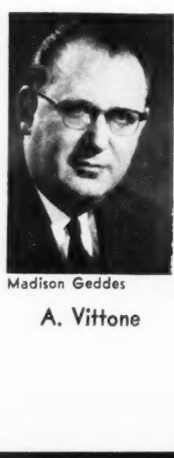
E. F. Jennings, Jr., is the plant manager of Hercules Powder Co.'s new polypropylene plant under construction at Lake Charles, La. **J. G. Copeland, Jr.,** succeeds him as plant manager of the Parlin, N. J., plant. **F. N. Bent** steps into Copeland's shoes as assistant plant manager, Parlin. Bent was technical assistant to the director of operations in the cellulose products department. In addition, **R. J. Bechtel** moves from Parlin to Wilmington, Del., to become technical assistant to the director of operations.

William N. Tune, Jr., has been appointed director technical sales for Imperial Color Chemical & Paper, a department of Hercules Powder Co., and will make his headquarters at Glens Falls, N. Y. **Paul H. Eliot** succeeds him as district manager in Atlanta, Ga.

R. J. Schoenenberger has been named general manager of product sales and chemical products development for Universal Oil Products Co., Des Plaines, Ill. **J. A. Neuman** succeeds him as head of chemical products development; while **D. D. Hansen** replaces Neuman as manager of the McCook, Ill., manufacturing plant. In addition, **W. K. Hunter** becomes head of catalyst sales.

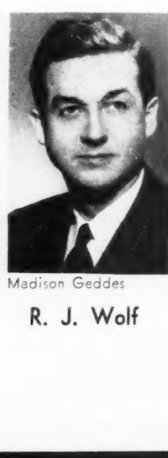
David L. Matthews has been appointed vice president, manufacturing, Goodrich-Gulf Chemicals, Inc., Cleveland, O. The former manager of manufacturing now is responsible for all the company's production facilities at Port Neches, Tex., and Institute, W. Va., and for the design and construction engineering activities of the corporation.

Harold B. Lawson has been elected secretary of United Carbon Co., New York, N. Y., to succeed the late **Carl H. McHenry.** Lawson will retain his present position of vice president, finance.



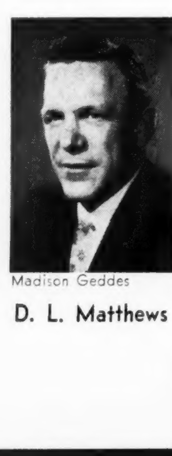
Madison Geddes

A. Vittone



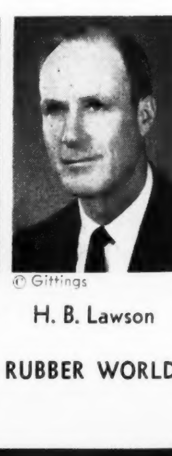
Madison Geddes

R. J. Wolf



Madison Geddes

D. L. Matthews



© Gittings

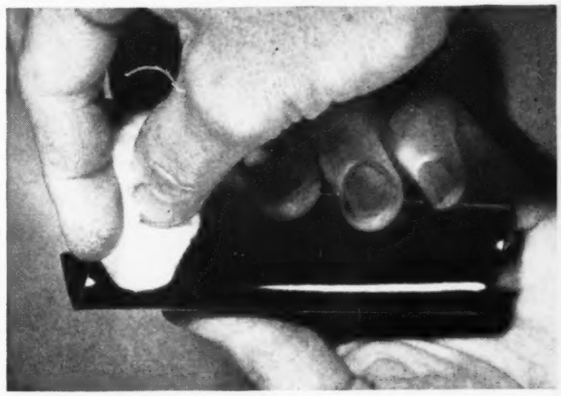
H. B. Lawson

HOW SULFASAN R ANSWERS YOUR CURING NEEDS IN NONBLOOMING, SCORCH-FREE, HEAT-RESISTANT COMPOUNDS OF SBR AND NATURAL RUBBER

Results with scores of different stocks compounded with SULFASAN R, powerful organic-type vulcanizing agent, all show increased heat resistance, greatly reduced scorch . . . and *no bloom* even after months of aging.

Economical SULFASAN R frequently trims costs, too . . . substantially reduces the total amount of curing agents required. About 1% of SULFASAN R on the rubber plus a small amount of THIURAD (tetramethylthiuram disulfide) achieves good results with most SBR and natural compounds.

Without SULFASAN R—*Stock Blooms Readily*



With SULFASAN R—*No Bloom at All*

SPECIFICATION: Withstand 70 hours @ 250° F. and 24 hours @ 325° F. in air oven without cracking when flexed 180°

COMPOUNDS	**A**	**B**	**C**
SBR 1500	100	100	100
Black	75	75	75
Zinc Oxide	5	5	5
Stearic Acid	1	1	1
Santoflex 75	1	1	1
Flectol H	2	2	2
Santocure	2	2	2
THIURAD	3.5	1.25	1.25
SULFASAN R	——	1.25	0.75
CURING AGENT COST	$3.99	$3.36	$2.59
TYPICAL RESULTS			
Mooney Scorch (Large Rotor @ 250° F.) Minutes for 10-point rise	8	11½	13
Unaged			
Tensile, psi	1880	2130	2070
Elongation, %	480	440	515
Hardness	60	60	59
Aged 70 Hours @ 250° F.			
Tensile, psi	2100	2260	2210
Elongation, %	260	235	290
Hardness	69	69	68
BLOOM	Immediately	None in 9 months	None in 9 months

SULFASAN R gives excellent aging at reduced cost . . . won't stain or discolor white rubbers. SULFASAN R disperses readily. Works well for butyl and Buna-N as well as SBR and natural rubbers . . . especially when used with SANTOCURE and other sulfenamide accelerators.

For further information about unique SULFASAN R, or help with a compounding project, write or phone, today.

Monsanto ®

MONSANTO CHEMICAL COMPANY
Rubber Chemicals Dept.
Akron 11, Ohio
HEmlock 4-1921

SANTOFLEX, SANTOCURE, FLECTOL, THIURAD, SULFASAN: T. M.'s, Monsanto Chemical Company

News about People


L. W. McCallum K. T. Kraner

Laurice W. McCallum will head the new offices of the industrial products department, J. M. Huber Corp., 1234 Melanie St., Baton Rouge, La., and will serve customers in the rubber and paper industries in the south-central section of the country. McCallum was formerly southeastern technical sales representative.

George D. Hitler becomes sales manager of private-brand tires for The Firestone Tire & Rubber Co., Akron, O. With Firestone's sales department since 1929, his most recent position was manager of dealer sales.

Richard G. Hayes will occupy the newly created post of technical consultant on urethanes, Dayco Corp. (formerly Dayton Rubber Co.), Dayton, O. Primarily associated with Dayton Industrial Products Co. division, Hayes will act as liaison man and coordinator for urethane development and product application programs with other divisions of the corporation.

I. Rogosin, president of Beaunit Mills, Inc., New York, N. Y., is the new chairman of the board, Tyrex, Inc., an association of Tyrex tire cord producers, with headquarters in New York. **Hayden B. Kline**, chairman of the board, Industrial Rayon Corp., Cleveland, O., has been named vice chairman of the Tyrex board; while **Maurice Winger, Jr.**, assistant to the president, American Enka Corp., Enka, N. C., is now treasurer of Tyrex.

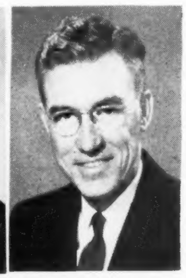
Charles J. Bradt and **Thomas J. Millett** have been appointed to the sales department of United Clay Mines Corp., Trenton, N. J. Bradt will cover the south and southwest areas of the country. Millett, formerly an industrial organic sales engineer with General Chemical Division, Allied Chemical Corp., will now cover the north central midwestern states for United Clay Mines.

Robert Betancourt is now chemist in charge of rubber compounding for Walker Brothers, Conshohocken, Pa. **Francis Marshall** becomes chemist in charge of plastic compounding.

Karl T. Kraner becomes marketing manager for Kessler Chemical Co., Inc., Philadelphia, Pa., and will be in charge of all the company's sales and sales development activities. Kessler manufactures and markets plasticizers and organic surface active agents for rubber and other industries.

Howard K. Norris is the new marketing manager of the mechanical goods division, United States Rubber Co., New York, N. Y. He was formerly production manager of the mechanical goods division.

John N. Hart has been elected a vice president, The B. F. Goodrich Co., Akron, O. In addition he will continue in his present post of controller, which he has held since 1957. Mr. Hart joined the company in 1945.

Fabian Bachrach Madison Geddes

J. N. Hart R. S. Loveless

Richard S. Loveless is now technical service representative of Goodrich-Gulf Chemicals, Inc., Cleveland, O. He was formerly with DeLaval Separator Co., where he was superintendent of its rubber plant.

R. L. Chieffo will represent Landers-Segal Color Co., Brooklyn, N. Y., in Illinois, Indiana, Wisconsin, and St. Louis, Mo. He will have charge of the sale of the colors and water dispersions to manufacturers of paints and industrial products.

L. J. Confer, formerly head of the belt engineering department, will fill a newly created technical staff position in the foreign technical assistance department, Dayton Rubber International, a division of Dayco Corp., Dayton, O. He will be responsible for expanding the division's technical service to overseas firms licensed to manufacture Dayton V-belts and other industrial rubber products.

Russell W. Buchanan has been appointed production control manager for Cary Chemicals, Inc., East Brunswick, and Flemington, both in N. J. He came to the company this year after having served with Dayton Rubber Co. in a similar capacity.

George P. Bunn, Jr., has been elected vice president, Columbian Carbon Co., New York, N. Y. Now in charge of all the firm's domestic and Canadian oil and gas operations, he will move his headquarters to New York from Houston, Tex., where he has been general manager of the Mid-Continent Oil & Gas Division. **Harry D. Page** becomes secretary of the company. He was general attorney since mid-1959 and will continue as a member of the board of directors and as general counsel.

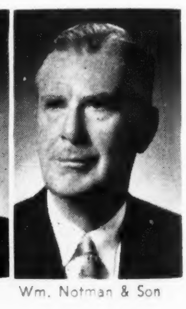
Woodrow W. Keisling has been appointed production superintendent, Moxness Products, Inc., Racine, Wis. A silicon rubber specialist, he joined Moxness last September. The company expects to complete its plant expansion program by the end of this year.

Justin A. Homan is now fatty acid sales representative, Southeast, for Armour Industrial Chemical Co., Chicago, Ill., and will make his headquarters at Charlotte, N. C. He succeeds **Lee Van Slyke**, who has been named assistant manager of fatty acid sales.

Othello Scarponi is now end-use development technologist for Caprolan nylon, Allied Chemical Co., fiber marketing department, New York, N. Y. He will be responsible for customer liaison in connection with the evaluation of cordage and tire yarn materials made of Caprolan nylon.

Granville T. Pownall succeeds **William M. Dougherty** as secretary of United States Rubber Co., New York, N. Y. Pownall held the post of assistant secretary from 1949 until his recent election to secretary. Dougherty retires after 37 years of service.

C. C. Thackray becomes chairman of the board, and **M. F. Anderson**, president, of Dominion Rubber Co., Ltd., Montreal, P.Q., Canada. Thackray has been president of the company since 1946. Last year Anderson became executive vice president. **H. E. Humphreys, Jr.**, former chairman, will continue as a director of the company.

Wm. Notman & Son Wm. Notman & Son

C. C. Thackray M. F. Anderson

News about People

Albert F. Kroeger, Jr., is now district sales manager, San Francisco area, for the mineral products division, Food Machinery & Chemical Corp., and will make his headquarters at the Newark, Calif., plant. He joined the company in 1956 as a sales representative, western territory.

David S. Conner is now sales representative for Hycar special-purpose rubber, B. F. Goodrich Chemical Co., Cleveland, O., and will serve the Rhode Island, southeastern Massachusetts, and eastern Connecticut area from his headquarters in Boston, Mass. With the company since 1955, his most recent position was product engineer in the Hycar technical service department, Cleveland.

Garret Hiers, Jr., of Titanium Pigment Corp., has transferred to Cleveland, O., to join the north central district sales staff. For the past eight years he was a sales representative with the Philadelphia, Pa., office.

Robert J. Roberts has been promoted to district manager, fatty acid sales department, Emery Industries, Inc., and will direct sales of the department's products from the New York, N. Y., and Boston, Mass., offices. His area includes New England, eastern New York State, and New Jersey.

F. Wayne Barnes has been appointed district sales manager for mechanical goods at the Kansas City and Omaha branches of United States Rubber Co., New York, N. Y. He replaces **William T. Pearl,** who is moving to a similar post at the Chicago branch.

Frederick L. Bissinger has been elected president and chief executive officer of Industrial Rayon Corp., Cleveland, O.; while **Hayden B. Kline** becomes chairman of the board of directors. Kline marks his thirtieth year as an officer of the company; he most recently served as president. Bissinger was formerly vice president and general manager. He was also elected a member of the board of directors and its executive committee.

F. L. Bissinger

H. B. Kline

Noyes Richey, formerly associate professional research chemist, is now section head of the recently organized polychemical department laboratory of Texas Butadiene & Chemical Corp., at Miami, Fla. In his new capacity, he will be responsible for establishing analytical characterization techniques for new products which will be developed and marketed by the department. **Albert L. Remsberg** joins the laboratory as analytical characterization chemist. He was formerly manufacturing research department chemist. In addition, **Robert E. Parks,** who has been with the company for 2½ years, is now a chemist with the new department.

Joseph Iannicelli has joined J. M. Huber Corp. as senior research chemist at the Borger, Tex., laboratory. Previously he was with E. I. du Pont de Nemours & Co., Inc.

J. Iannicelli

W. F. Christopher

William F. Christopher has been named director of marketing for Hooker Chemical Corp., New York, N. Y. He was previously manager of market development for the chemical materials department, General Electric Co.

Lyle L. Shepard has been elected a director of The Ruberoid Co., South Bound Brook, N. J., to fill an existing vacancy. Shepard is also president of Columbian Carbon Co. and director of all its subsidiaries. Ruberoid produces building materials and industrial specialties.

Paul G. Carpenter on May 11 was elected president of Copolymer Rubber & Chemical Corp., New York, N. Y. **A. K. Walton,** former president, has been named chairman of the board. Dr. Carpenter joined the company in December, 1956, as director of research and development and last fall was made executive vice president and general manager. His office will be at the Baton Rouge, La., plant.

James G. Shannon, Jr., has been appointed regional manager of Tyrex, Inc. His headquarters will be in Detroit, Mich. He was formerly general sales manager of Fisher Industries.

R. A. Mertz

R. V. Fisch

Roland V. Fisch succeeds **Raymond A. Mertz** as vice president in charge of manufacturing and engineering for The Ohio Rubber Co., Willoughby, O. Fisch was previously director of engineering at the Willoughby plant. Mertz retires after 26 years with the company, but will continue in an advisory capacity until the Fort Smith, Ark., plant, now under construction, is completed.

Charles A. Wales has been appointed a superintendent of the Bound Brook, N. J., plant, Union Carbide Plastics Co. In his new position he will share plant responsibilities with **T. F. Archer,** superintendent. Wales was formerly with the Texas City, Tex., plant of Union Carbide Chemicals Co.

John A. Cover has been appointed technical manager of the Port Neches, Tex., plant, Goodrich-Gulf Chemicals, Inc. Since the beginning of the plant's operations in 1942, he has served in various posts, most recently as general foreman, technical.

Henry W. Willard becomes production manager of the mechanical goods division, United States Rubber Co. Operating out of the New York, N. Y., office, he will supervise plant production and product development at Philadelphia, Pa.; Passaic, N. J.; and Sandy Hook, Conn.

Bodie C. Pryor has been named manager of polyethylene operations at the Goodrich-Gulf Chemicals, Inc., Port Neches, Tex., polyethylene plant now being built. Pryor was technical manager of the plant, which should be operating later this year.

Charles H. Baker replaces **R. B. Bogardus,** retired, manager of all rubber purchasing for Goodyear Tire & Rubber Co., Akron, O. **Hollis Johnson** succeeds Baker as manager of synthetic rubber purchasing. Baker joined Goodyear in 1919.

D. Ernest Milligan has been made assistant manager, truck tire sales for Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., Canada.

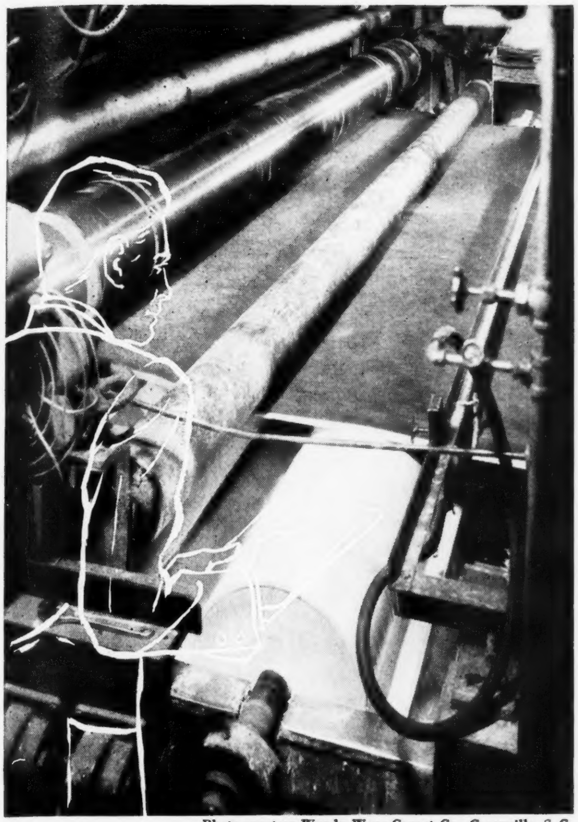


Photo courtesy Wunda-Weve Carpet Co., Greenville, S. C.

HOW THE SILICONES MAN HELPED... DEFOAM RUBBER LATEX AT LOW COST

Manufacturers of rubber latex rate SAG Silicone Antifoams "tops"—particularly in the sensitive, critical processing areas where control of foam may determine the quality and cost of products.

One latex compounder reports, "SAG Silicone is highly effective in reducing foam formed during manufacture and packaging of a variety of latex emulsions. By cutting down on the foam volume we save money and increase equipment efficiency." *A manufacturer of non-woven fabrics says,* "Small concentrations of SAG Silicone, between 50 and 100 parts silicone per million, prevent foam formation in the latex saturator, improving adhesion between latex backing and material."

Years of research went into development of SAG Antifoams to make them *Fight Foam Fast.* Less than 50 parts per million will often do the job. There are two types: SAG 470 Emulsion for aqueous systems; SAG 47 Fluid for non-aqueous systems. Just a few cents worth can eliminate thousands of cubic feet of costly, space-eating foam in rubber latex.

Both SAG products are shipped ready to use. Write for samples and information. Address Dept. FS-4906. Silicones Division, Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. (*In Canada:* Bakelite Company, Division of Union Carbide Canada Limited, Toronto 7.)

Unlocking the secrets of silicones

Rubber, Monomers, Resins, Oils and Emulsions

UNION CARBIDE SILICONES

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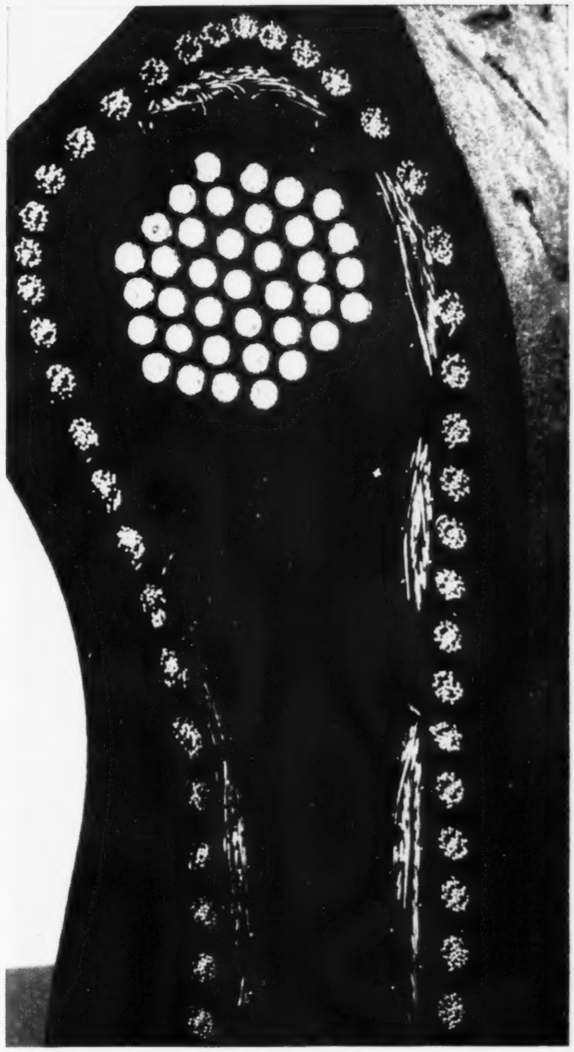


WIRE-IN-RUBBER

... problem solved

The hexagonal bead in the photo above is a new type of tire bead developed for use in single wire-ply tires where conventional square beads are not practical. Hexagonal bead grommets are already in metal-ply bus and truck tires now on road tests and under development.

The design and manufacture of a special bead-winding machine for producing a variety of bead-grommet cross sections is another National-Standard contribution to the rubber industry. It is typical of the many solutions to wire-in-rubber problems that have come from National-Standard engineers for over 50 years. Call National-Standard for help in solving your wire-in-rubber problems.

NS NATIONAL-STANDARD COMPANY

NATIONAL-STANDARD COMPANY
Niles, Michigan

OBITUARIES

Albert Whitelaw

Albert Whitelaw, retired executive of Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J., died suddenly April 24 of a heart attack.

He joined the company in 1917, but left to serve with the Army artillery in France during World War I. He returned to Manhattan in 1922, worked on molded rubber products production, and helped perfect the first successful hydraulic-brake piston cup. Later Mr. Whitelaw was transferred to production and development of friction material and advanced to manager of the friction materials departments, in charge of production, laboratory, development, and field testing.

He also directed the operations of the company's fleet of test cars in mountainous areas and the building of one of the largest inertia dynamometers capable of testing braking forces equal to stopping a train. In addition, the deceased helped develop Hycoe brake lining, the first non-fading brake lining made. He retired on January 1, 1960.

Mr. Whitelaw was born December 5, 1899, in Brooklyn, N. Y.

He was a member of the Society of Automotive Engineers and the Masons.

Funeral services were held April 27 at Van Emburgh's Funeral Home, Ridgewood, N. J. Interment took place in Paramus, N. J.

His wife survives him.

C. P. Hall

Charles P. Hall, president, chairman, and founder of The C. P. Hall Co., Akron, O., died of a heart attack on April 17 at his home in Akron.

He joined Firestone Tire & Rubber Co. in 1917 as a buyer and left in 1919 to organize The C. P. Hall Co. He was its president from 1919 to 1960. In addition he formed The C. P. Hall Co. of California, Los Angeles, Calif., in 1928, and The C. P. Hall Co. of Illinois, Chicago, Ill., in 1945. The deceased also was cofounder and president of Halon Chemical Co., Inc., New York, N. Y., and was president of General Investment Co., Akron, which he formed in 1930.

Mr. Hall held membership in the Portage Country Club, the Chemists Club (New York), and the Chicago Athletic Association. He was also active in Masonic circles.

Mr. Hall was born on April 17, 1889, at Olena, O., and attended school there. He received his further education at Marshall College, Huntington, W. Va.

Funeral services were held April 20 at Cox Funeral Home, Akron, with burial the same day at Rose Hill Memorial Park, Akron.

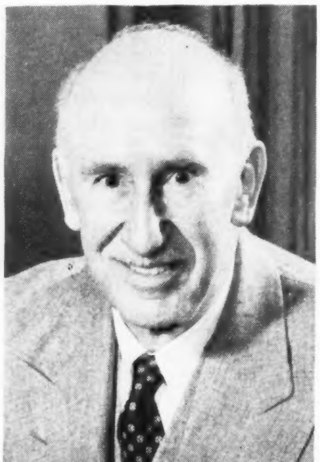
Surving him are his wife, two sons, one daughter, a brother, and eight grandchildren.

Joseph W. Childs

Joseph W. Childs, international vice president, United Rubber, Cork, Linoleum & Plastic Workers of America, died April 24, in Akron City Hospital, Akron, O.

He started working at The General Tire & Rubber Co. as a tire builder in 1928, and in the 1930's helped organize Federal Labor Union 18323, which later became United Rubber Workers Local 9. He served as president of his local for several years, and during the war was a member of Cleveland Regional War Labor Board and an alternate to the National War Labor Board at Washington, D. C.

Upon his return to General Tire in 1946, Mr. Childs again became president of his local until 1949, when he was elected general vice president of the union at an international convention. Until his death he was considered the likely successor to President Buckmaster who is scheduled to retire in September.



Hittle Studios, Ltd.

C. P. Hall

The deceased was born March 21, 1910, at Barrackville, Pa.

His wife, two daughters, and a son survive him.

Funeral services were held April 27 at Goodyear Heights Methodist Church, Akron, and burial services at Rose Hill Cemetery.

Walter S. Edsall

Walter S. Edsall, development manager of the Goodyear Tire & Rubber Co. plant at Windsor, Vt., and a member of RUBBER WORLD's editorial advisory board, died suddenly on April 12.

Mr. Edsall joined Goodyear in 1929 as a foreman in soles and heels production at Akron, O. In 1936 he was assigned to the Windsor plant as chemist and was later promoted to chief chemist (1941) and then assistant development manager (1946). In 1951 he became development manager.

The deceased joined the RUBBER WORLD advisory board in January, 1957, in which capacity he served as a consultant in the footwear and shoe products field.

He was born April 23, 1905, at Pueblo, Colo. He attended high school in Hot Springs, Ark., and was graduated from Maryville (Tenn.) College in 1926 with an A.B. degree in chemistry. After graduation he worked at several jobs in the Arkansas oil fields until he joined Goodyear.

Mr. Edsall was a member and a past director of the Division of Rubber Chemistry of the American Chemical Society, as well as a member of the Boston Rubber Group, the Masons, and the Rotary Club.

Funeral services took place, April 15, at Windsor.

He is survived by his wife, a son, and a daughter.

Walter S. Edsall

Obituaries

Robert J. Peters

Robert J. Peters, former sales representative and assistant to the vice president of The New Jersey Zinc Co., New York, N. Y., died May 12 at his home in Flushing, N. Y.

Mr. Peters joined the company at Palmerton, Pa., in 1910. He became assistant chief, lithopone, East, in 1915 and later acted in an advisory capacity during construction of the lithopone plant at Depue, Ill. In 1924 he became chief of the lithopone department at Depue. He moved to the company's main headquarters in New York in 1926 as sales engineer and remained at that address until his retirement after more than 40 years with the firm.

A Requiem Mass was sung at St. Andrew Avellino Church, Flushing, on May 16, followed by interment in Calvary Cemetery, Queens, L. I., N. Y.

Survivors include the widow, a brother, a nephew, and a niece.

R. J. Peters

John B. Rubins

John B. Rubins, a long-time auditor for The Firestone Tire & Rubber Co., Akron, O., died of cancer in an Akron, O., hospital on April 19.

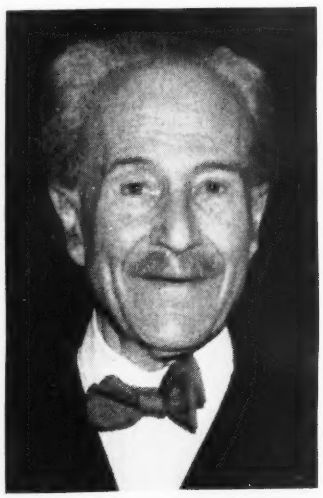
He joined Firestone in 1931 and in 1956 became comptroller of Ravenna Arsenal, Inc., a subsidiary. In 1958 he returned to the Akron Firestone plant.

Mr. Rubins was born 52 years ago in Kenton, O. He was graduated from Miami University.

The deceased was active in the Akron YWCA. He belonged to Delta Kappa Epsilon, Delta Sigma Pi, First Methodist Church, and Methodist Men's Club.

He is survived by his wife, two sons, his mother, a brother, a sister, and one grandson.

Services were held at the Billow Memorial Chapel, Akron.



P. Schidrowitz

Philip Schidrowitz

Philip Schidrowitz, leading British authority on rubber and associated industries, consultant to firms in Great Britain and the United States, and weekly columnist for *The Rubber Journal and International Plastics*, died May 17 at his home in Ealing, England.

Dr. Schidrowitz began to study rubber chemistry and technology in 1904 after earlier research in distillation and brewing. A leader in technical research and authority on growth and production, he is also author of very many papers and patents, many of which are still basic to the rubber industry. His works include the book, "Rubber," published in 1911; the "Rubber" article in Thorpe's "Dictionary of Applied Chemistry"; for 40 years a weekly column, "Views and Reviews," for *The Rubber Journal and International Plastics;* and (with T. R. Dawson) "Rubber Derivatives of Commercial Utility in Chemistry," as well as articles on distillation for "Encyclopaedia Britannica."

In 1914, with Dr. Goldsborough, the deceased produced the first direct-from-latex sponge and patented the process. He also was credited with the first work on vulcanization of wet coagulum, which he also patented. He was responsible for specifications to standardize natural rubber and did early work on application and use of accelerators. The development of softened rubber and expanded chlorinated rubber is also numbered among his achievements.

Dr. Schidrowitz was among the founders of the Institution of the Rubber Industry, received its Colwyn Gold Medal in 1940, and in 1959 was elected the first life vice president. He was consultant to the Rubber Growers Association and the British Rubber Producers' Research Association. He was, moreover, a Fellow of the Chemical Society and a member of the Society of Chemical Industry.

Born October 13, 1872, in Germany, he became a naturalized British citizen before the turn of the century. Dr. Schidrowitz was educated at St. Charles College and University College School, London; Swiss Federal Polytechnic, Zurich; and the University of Berne.

His funeral took place May 19 at Golders Green Crematorium.

Surviving him are his wife and two sons.

Donald H. Walker

Donald H. Walker

Donald H. Walker, 48, treasurer of Goodyear Tire & Rubber Co., Akron, O., died May 14, following a heart attack. The Goodyear directorate had elected him treasurer May 3. He had been assistant treasurer since 1952. With the May 3 appointment, he was elected also a director of the Goodyear State Bank.

Walker had completed 27 years of continuous service with Goodyear. He started as a clerical employe out of the University of Akron.

Assigned to the company treasurer's office in 1935, he completed a number of overseas assignments in Sumatra, Brazil, the Caribbean area, and England.

Walker last February became president of the Akron YMCA board of trustees. He was also the long-time treasurer and a board member of Old Trail School and a member of Phi Delta Theta, and Akron City Club.

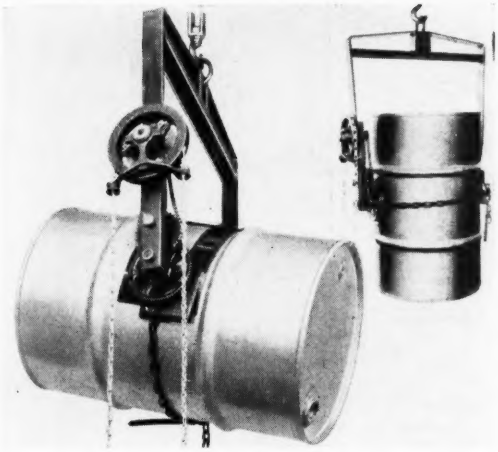
The deceased was born in Somerset, Pa., but spent most of his early life in Akron where he attended public schools.

He leaves his wife, a daughter, a sister and a brother.

Burial was in Rose Hill Cemetery, Akron.

New Equipment

(Continued from page 70)



A new Kontrol-Karrier, Model 185, designed to give controlled pouring at any height or location in the plant on standard 55-gallon drums, has been announced by Morse Mfg. Co., Inc., East Syracuse, N. Y. The unit is hooked (insert) to a monorail hoist, crane, or chain block, and its saddle is fastened to the drum. The tipping operation is handled by one man on the floor handling the chain loop. The unit includes six-foot chain drop or 12-foot overall length. Longer lengths are available. The unit will handle 800 pounds liquid or 500 pounds dry loads with safety and ease.

New M-H Standard Foaming Conveyor

A new Armorbelt continuous foaming machine for the production of urethane, polyester, and polyether foam, has been announced by the M-H Standard Corp., Jersey City, N. J. The unit consists of a wide metal belt conveyor in a truss support. It is pivoted at the pouring end and is equipped with a hand-wheel operated raising mechanism to adjust the conveyor to the correct downward slope for proper foaming.

The pouring end is equipped with side fences to support a pouring paper. The spacing between fences is adjusted by a single hand-wheel for a width of from 24 to 80 inches. Provision is made in both the conveyor and side fences for the hot-air heating of the foam blanket.

A remote controlled variable-speed drive allows the operator conveniently to change speed during operation. An automatic take-up is provided to compensate for temperature changes. The metal conveyor belt is zinc coated for easy cleaning. It runs on a steel track for a smooth, even ride and is laterally guided by ball-bearing rollers to prevent layer separation of the foam. The conveyor body is fully enclosed for cleanliness and safety. A positive sprocket drive is said to guarantee uniform speed.

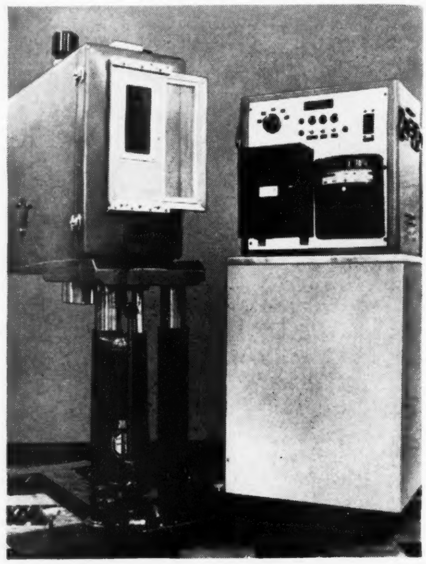
The Armorbelt foam conveyor, which is protected by a patent, is 80 feet in length. The fences are 30 feet long, with an additional removable 10-foot section in the foaming head area.

Literature is available from the company.

FRL Extreme Temperature Chamber

A new apparatus facilitating the study of non-rigid materials at extreme temperatures has been announced by Fabric Research Laboratories, Inc., Dedham, Mass. Called the FRL extreme temperature test chamber, the new apparatus is designed prin-

New Equipment



FRL test chamber (left) and control box

cipally for use with Instron tensile testing instruments and makes possible tensile and compressional tests at a temperature range from —95 to 1000° F.

Interest in the behavior of materials such as textiles, plastics, rubber, wire, ceramics, etc. at these extreme temperatures includes not only their use in missiles or other devices which travel at ultra-high speeds, but in numerous industrial applications as well.

The FRL chamber, in conjunction with the Instron, permits the use of most normal jaws and allows for tensile testing of 10-inch samples with up to 80% rupture extension. Precise control over the full temperature range is ±1 to 2° F.

The chamber is not limited, however, to Instron applications. Self-contained on a rollaway carriage, it can be used independently as an oven or cold chamber, with working space of about 3,000 cubic inches, dimensioned 12 inches by 9.5 inches by 26 inches. Special chambers can also be constructed with larger dimensions.

The chamber is built under license from FRL by Custom Scientific Instruments, Inc., Kearny, N. J. It can be constructed with varying temperature ranges conforming to purchaser's specifications and is reported to be relatively inexpensive even at its full temperature capacity.

New Sturtevant Blender/Hopper

A new, wholly automatic rotary blender and hopper, on a movable bed, forms a processing bridge, blending materials as they come from other processes, introducing them directly into the next. A supplemental hopper holds other ingredients to be introduced into the next process, yet keeps them from intermixture with the blending materials until the designated time has been reached.

The blenders, available in capacities of from 500 pounds to 20 tons are manufactured by Sturtevant Mill Co., Boston, Mass. Hopper capacity is variable. The multi-purpose units are said to be dusttight, keeping their seals during filling, discharging, and even while the blender is in transit.

As all moving parts and controls are either motor driven or cylinder actuated, the new unit can fit into existing plants without requiring major adaptations. The entire process can be controlled from one panel.

The new unit differs from standard Sturtevant equipment in that it combines complete automation with transportability, and

(Continued on page 146)

New Equipment

(Continued from page 144)

has two chambers—one for blending, one for storage. Atop the unit, two dusttight charging hatches are used. One feeds directly into the blending drum; the other into the stationary chamber. Both may be fed directly from process units. Both introduction gates are custom-engineered to customer specifications.

The blending chamber is the same basic drum proved on the standard Sturtevant blenders. Its four-way blending action begins during charging and continues during discharge to assure no loss of blend. Highly intimate intermixtures may be achieved within two to five minutes, and a complete blending cycle, from charge to completion of discharge, may be accomplished within four to seven minutes on most materials, reports the Sturtevant company.

Baker Perkins Heating-Cooling Unit

A new heating and cooling unit, developed for continuous mixers used in compounding or processing rubbers and plastics, where accurate temperature control is required, has been announced by the chemical machinery division of Baker Perkins, Inc., Saginaw, Mich. Adapted for the company's four-inch-size Ko-Kneader continuous mixer, the new unit controls temperatures to within ±2 degrees, regardless of the mixer area involved.

The unit heats or cools pressurized water or heat transfer oil which is circulated through the jackets of the mixer and/or extruder. Pressurized water is handled at temperatures up to 360° F. outside of the tubes, and steam at 375° F. inside the tubes.

The unit includes three circuits, two of which provide controlled heat for the circulating medium, and one for handling cold water for cooling. One of the controlled heat circuits is piped to the mixer screw and discharge end of the mixer barrel or die, or to the extruder barrel and screw. The cold-water circuit leads to the mixer hopper and, if required, to the extruder barrel and screw.

Each of the controlled temperature circuits has a flow of nine gallons per minute and can supply a maximum of 15,000 BTU's per hour to the batch. The flow of steam to the heater, and water to the cooler, is controlled by automatic valves, thermostatically controlled.

New Publications

(Continued from page 60)

"Technical Notes—'Viton' Copolymers of Hexafluoropropylene Vinylidene Fluoride." Stillman Rubber Co., Culver City, Calif. 1 page.

"Plastolein Plasticizers." Emery Industries, Inc., Cincinnati, O. 30 pages.

"Infrared Sections Catalog 103." Infrared division, Fostoria Corp., Fostoria, O. 2 pages.

"Temp-R-Tape—Pressure-Sensitive 'Teflon,' Fiberglas and Silicone Rubber Tapes." The Connecticut Hard Rubber Co., New Haven, Conn. 6 pages.

"Hi-Sil 233." Columbia-Southern Chemical Corp., Pittsburgh, Pa. 1 page. Reissue of Hi-Sil Bulletin No. 4.

"Mobile Program of Correct Lubrication." Mobile Oil Co., New York, N. Y.

"How to Design and Prepare Tanks for Lining." Protective Coating Division, Metalweld, Inc., Philadelphia, Pa. (Tank Preparation Wall Chart).

"Coatings for Vacuum Metallizing." Logo Division, Bee Chemical Co., Chicago, Ill. 45 pages.

"Link-Belt Roller Chains and Sprockets." Book 2575. Link-Belt Co., Chicago, Ill. 44 pages.

" 'Naro-Aisle-Stack' Series Fork Lift Truck." Towmotor Corp., Cleveland, O. 18 pages.

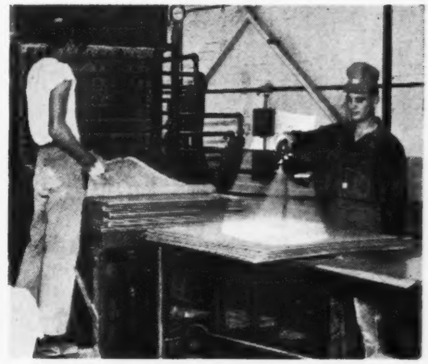
Pop Out Perfect Products

Dow Corning Silicone Mold Lubricants Assure Finer Details, Fewer Rejects

Toys and dolls, mats and heels, tires and tile — all kinds of rubber products — pop out cleanly, time after time after time, from molds lubricated with Dow Corning Silicones. These silicone release agents give uniform stick-free release . . . assure sharp surface detail, reduce rejects to a bare minimum, increase profits.

Dow Corning mold lubricants help you realize noteworthy savings, too . . . practically eliminate the need for cleaning molds. In turn, mold downtime is reduced . . . service life increased. New production efficiency, better looking products, lower maintenance costs, less waste . . . advantages like these have led more and more molders of rubber products to standardize on Dow Corning silicone release agents.

Easy and economical to use, Dow Corning mold lubricants are available in a variety of forms . . . for all types of rubber . . . for all types of molds.



Water-dilutable emulsions, solvent soluble fluids, greaselike compounds, different forms for different uses. Whatever you make . . . if it's molded of rubber — you can count on Dow Corning development engineers to formulate a silicone mold lubricant that'll release it efficiently and economically!

More Cost-Saving Silicones . . . In other areas of the rubber industry, too, Dow Corning Silicones have proved to be time and money savers: as electrical insulation

for mill and mixer motors; as anti-adhesive coatings for bags, containers and interleaving; as heat-resistant paints that also resist weathering and corrosive atmospheres; as lubricants for ball bearings; and as Silastic® gums and bases for compounding silicone rubber stocks to meet severe performance requirements. For more information about silicone release agents or other silicones for the rubber ,industry, write Dow Corning, Dept. 7906.

Your nearest Dow Corning office is the number one source for information and technical service on silicones.

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Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

MARKET REVIEWS

Natural Rubber

Although values during the April 16-May 15 period have advanced, the sentiment in the natural rubber market remains unchanged. The squeeze on RRS #1 for May shipment in the Far East has been the main cause of the advance in price. Rubber has been quoted at about 40¢ a pound recently, about 5¢ higher than during last year and 15¢ over 1958 prices. There has been, consequently, owing in part to the recent shortage of supplies and in part to the growing demand by European and Communistic countries, a widening in differentials and continued poor offtake from consuming quarters.

This situation in the Singapore market has only been partly reflected in New York and London. In the latter markets manufacturers still appear to be well supplied from other sources. Owing to the availability of stockpile rubber, these manufacturers are not prepared to pay Singapore's prices except perhaps for Blankets. Sizable quantities of Blankets are said to have been traded at the widening differentials.

The International Rubber Study Group estimated world consumption of natural rubber this year at 2,100,000 long tons, and world production at 2,135,000. Some London rubber dealers predict a world shortage of natural rubber of 40,000 tons or more, later this year. A survey indicated that in the United States the view is held that natural rubber supply will equal and possibly exceed demand this year, although there may be some periods of shortages. World consumption last year was 40,000 long tons more than production.

The General Services Administration during the period under review announced a new sales plan for 27,995 tons of stockpiled rubber. The agency also announced that April sales of stockpiled rubber amounted to 3,651 tons. Also, during this period, Congress gave its formal consent to the sale of 470,000 tons of rubber from the stockpile over the next nine years.

The British Board of Trade reported that April sales from its stockpile amounted to 7,212 tons, adding that 53,969 tons of rubber remained available on May 1. It was reported that Russia had purchased an additional 4,000 tons of natural rubber from the British stockpile during the period under review.

April sales, on the New York Commodity Exchange, amounted to 10,070 long tons, compared with 14,130 long tons for March contract. There were 20 trading days in April, and 20 during the April 16-May 15 period.

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 41.18¢ per pound for the April 16-May 15 period. Average April sellers' prices for representative grades were: RSS #3, 40.09¢; #3 Amber Blankets, 39.57¢; and Flat Bark, 36.22¢.

REX CONTRACT

1960	Apr. 22	Apr. 29	May 6	May 13
May	40.10	40.55	41.80	43.80
July	39.40	39.72	40.30	47.20
Sept.	38.92	39.21	39.60	40.72
Nov.	38.40	38.65	39.05	39.90
1961				
Jan.	38.10	38.05	38.30	39.10
Mar.	37.50	37.45	37.60	38.20
May	37.00	37.00	37.00	37.40

NEW YORK OUTSIDE MARKET

	Apr. 22	Apr. 29	May 6	May 13
RSS #1	40.25	40.50	41.63	43.50
#2	40.13	40.38	41.50	43.00
#3	40.00	40.25	41.13	42.63
Pale Crepe				
#1 Thick	45.50	45.75	46.38	47.75
Thin	46.75	46.75	46.88	48.00
#3 Amber Blankets	39.50	39.75	39.13	40.63
#3 Thin Brown Crepe	39.38	39.50	39.13	40.63
Standard Flat Bark	36.00	36.13	35.25	36.00

Synthetic Rubber

Consumption of new rubber in the United States for April totaled 132,710 long tons, compared with the 144,932 long tons consumed during March. Synthetic rubber production, amounting to 121,012 long tons for April, was down somewhat from the record-setting 131,933 long tons for March, according to the monthly reports of The Rubber Manufacturers Association, Inc.

Consumption of all types of synthetic rubber fell to 90,480 long tons in April, contrasted with the 97,727 long tons in March. The percentage of synthetic rubber of the total new rubber used in April set a new high, however, with 68.18%. Previous high ratio was reached in December, 1959, with 67.50%, and the March figure was 67.43%.

Consumption (in long tons) by type in April, compared with March usage, decreased for all types, as follows: SBR, 75,610, against 81,065; CR (neoprene), 6,750, against 7,693; IIR (butyl), 5,660, against 6,324; and NBR (nitrile), 2,460, against 2,645.

Total synthetic rubber exports for April decreased slightly to 33,340 long tons from the 34,290 long tons in March. Total synthetic stocks also dropped to 221,590 long tons in April from March's 223,738 long tons.

Masterbatch production also showed the same general downward trend, with oil-black masterbatches decreasing less percentagewise. Black masterbatch was down to 2,845 long tons in April from the 4,018 long tons in March; oil masterbatch declined to 32,461 long tons, against March's 42,051; while, by contrast, the oil-black masterbatch production of 21,258 long tons compared more favorably with the 23,825 long tons produced in March.

Latex

The drum latex market continued quiet during the April 16-May 15 period. Supplies of May and June shipments were not too plentiful, but prospects for the second half of the year were uncertain. With the further advance in the value of dry rubber, buyers apparently were unwilling to cover their future requirements. At the same time they are going more and more over to the use of synthetic latices.

There has been a definite trend in the United States and other countries to use synthetic latices at the expense of natural latex, as evidenced by a diminishing natural synthetic ratio. Even in Japan, where previously only natural latex was used, some of the important consumers were reported to be switching to synthetic latices on a large scale.

United States stocks at the end of March stood at 13,964 tons and were almost equal to three months' consumption at the current rate.

Shipments from Malaya during March totaled 10,139 tons, compared with 11,367 tons in the previous month. Some 2,025 tons were shipped to the United Kingdom, 2,302 tons to the United States, and 1,544 tons to Japan, against 2,709 tons, 1,900 tons, and 1,478 tons, respectively, in February.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 49.61¢ per pound solids. Syn-

FOR 40 YEARS

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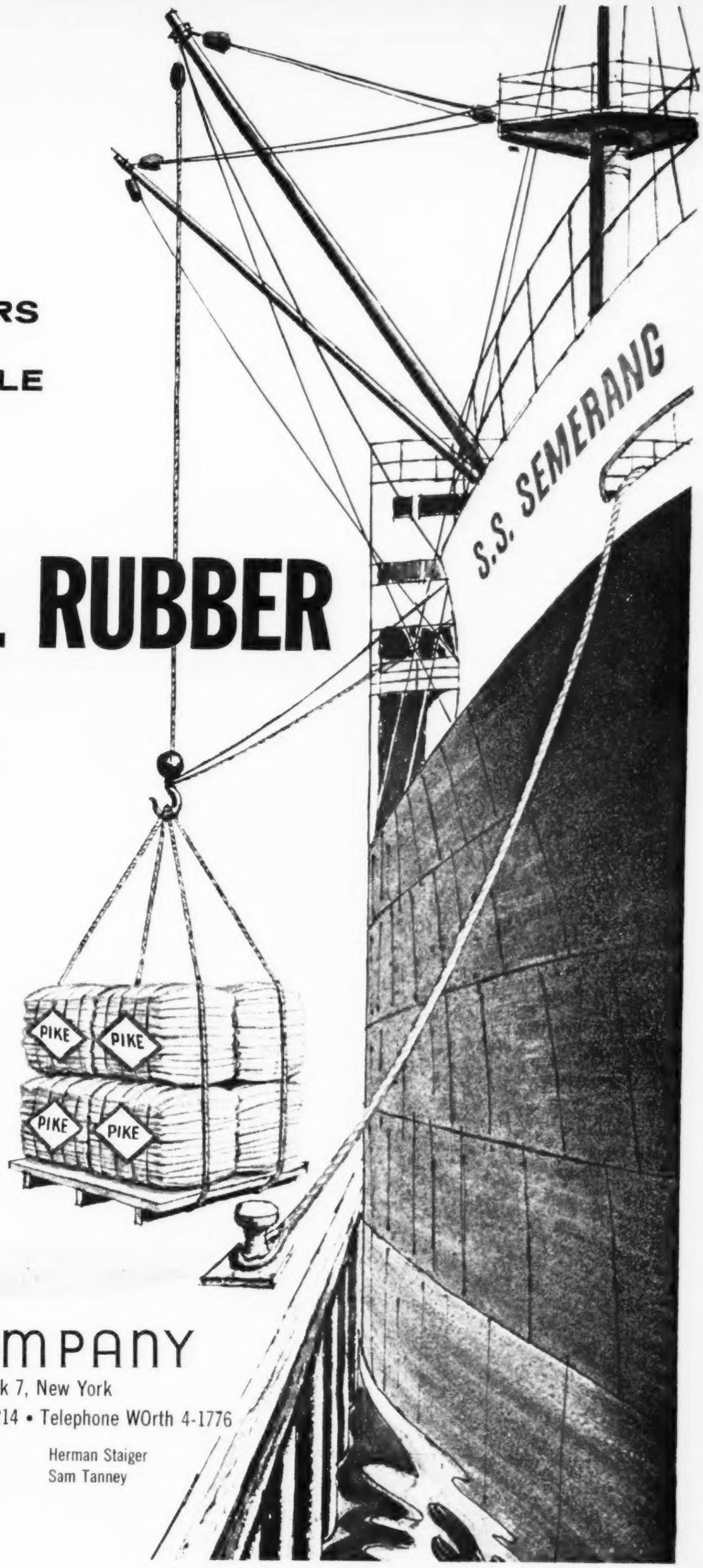
SOURCE OF

NATURAL RUBBER



Importing Natural Rubber is about 95% of our total business. We make direct purchases in many foreign lands, including Ceylon, Malaya, Sumatra, Java, Borneo, Cambodia, Vietnam, Burma, Bolivia, Brazil, Nigeria, Belgian Congo.

Forty years experience in importing Natural Rubber. Specialized grades for particular uses.

SJP

S. J. PIKE COMPANY

30 Church Street • New York 7, New York

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SALES DIVISION: Sidney J. Pike, George Steinbach, George Jatinen, Herman Staiger, Sam Tanney

thetic latices prices were 26.0 to 40.25¢ for SBR; 37 to 57¢ for neoprene; and 45 to 60¢ per pound for the nitrile types.

(All figures in long tons, dry weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Feb.	0	5,812	5,463	12,974
Mar.	0	*	4,847	13,964
SBR				
Feb.	9,862	—	7,838	8,606
Mar.	9,351	—	8,104	8,055
Neoprene				
Feb.	1,085	0	969	1,534
Mar.	1,004	0	1,076	1,518
Nitrile				
Feb.	1,098	0	1,000	2,535
Mar.	1,217	0	927	2,492

* Not available yet for period covered.

Scrap Rubber

During the first part of the April 16-May 15 period moderate activity was noted in the scrap rubber market. Most of the trading interest was in the tube section, with synthetic butyl tubes moving at 8.25¢, at both eastern and midwestern points. Mixed auto tubes and black passenger tubes were at 6.00¢, both in the East and the Midwest.

Although the scrap rubber market was described as lacking any outstanding feature toward the close of the period under review, fairly good activity was reported. Mixed auto tires in the East moved at $7.00 to $12.50, the high side of the range applicable only on shipments to Buffalo. Synthetic butyl tubes continued at 8.25¢, both at eastern and midwestern points.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$7.00	$12.50
S.A.G. truck tires	nom.	17.00
Peeling, No. 1	nom.	33.00
2	nom.	22.00
3	nom.	19.00
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	6.00	6.00
Black	6.00	6.00
Red	6.25	6.25
Butyl	8.25	8.25

Reclaimed Rubber

A reclaimer in the East reported that it experienced a drop-off in business during the April 16-May 15 period. The company's customers said that the automotive industry had slowed down in its buying because of a high finished automobile inventory. As buying of new cars picks up, the activity is expected to be felt up the line to the reclaimers. Inasmuch as some 60% of reclaimed rubber output goes into tires, it is natural for automobile sales to affect reclaimers.

Another reclaimer in the East reported that it had experienced approximately a 10% increase in its area over business during the previous 30-day period. This company expected a further increase in the next 30-days.

The price of butyl tube reclaim was increased again on May 1 by 1¢ a pound; otherwise, prices are the same as previously reported.

According to The Rubber Manufacturers Association, Inc., report, April production of reclaimed rubber was 26,225 long tons; while consumption was 24,200 long tons. March figures had been: production, 29,100 long tons; consumption, 26,625 long tons.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.115
Third line	.1075
Inner tube, black	.17
Red	.21
Butyl	.17
Light carcass	.22
Mechanical, light-colored, medium gravity	.185
Black, medium gravity	.10

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

Industrial Fabrics

The industrial grey cotton goods market toward the close of the April 16-May 15 period was undergoing a period of testing as to which price levels would release a surge of contract buying, according to trade sources. It was a time for both caution and boldness in arriving at a common denominator, pricewise, to set new business into active motion again. It was felt that the market was just about ready to get into action on July-forward yardage requirements.

Some forward business began to appear, though the volume made noticeable that amount of still-pending contract selling. For the most part, the commitments entered into between mills and buyers were for June deliveries. There were contracts placed for production covering July and August. While these were usually small yardages, they indicated that the market was ready for increased consideration of larger-quantity and longer-term delivery negotiations.

So far, the market considers it a time when buyers themselves are partly in the dark about the true grey goods values. Some lower than acceptable bids have been made, partly for the purpose of getting the "feel" of the price and supply trend. Less resale yardage was observed, though, according to one source, sometimes up to 50,000 yards of a lot was seen. It helped to make confidence increase when old contracts started running out. Some requests to hurry up deliveries show that finished goods business is keeping up favorably.

Industrial Fabrics

Drills*

59-inch, 1.85, 68x40	*yd.*	$0.40
2.25, 68x40		.34

Broken Twills*

54-inch, 1.14, 76x52	*yd.*	.52
58-inch, 1.06, 76x52		.585
60-inch, 1.02, 76x52		.5825

Osnaburgs*

40-inch, 2.11, 35x25	*yd.*	.2275
3.65, 35x25		.1525
59-inch, 2.35, 32x26		.30
62-inch, 2.23, 32x26		.31

Ducks

Numbered Duck†

List less 45%

Enameling Ducks*

	S. F.	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.33
51.5-inch, 1.35 yd.	.4738	.4888
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538

Hose and Belting Ducks*

Basis	*lb.*	.67

Army Duck†

52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.)	*yd.*	.5925

Sheeting*

40-in, 3.15, 64x64	*yd.*	.2175
3.60, 56x56		.185
52-inch, 3.85, 48x48		.245
57-inch, 3.47, 48x48		.25
60-inch, 2.10, 64x64		.39
2.40, 56x56		.345

Sateens*

53-inch, 1.12, 96x60	*yd.*	.645
1.32, 96x64		.575
57-inch, 1.04, 96x60		.615
58-inch, 1.02, 96x60		.7025
1.21, 96x64		.6275

Chafer Fabrics*

14.40-oz./sq.yd. P.Y.	*lb.*	.74
11.65-oz./sq.yd. S.Y.		.65
10.80-oz./sq.yd. S.Y.		.68
8.9-oz./sq.yd. S.Y.		.70
40-inch, 2.56, 35x25		.25
60-inch, 1.71, 35x25		.435

* Net 10 days.
† 2% 10 days.

Rayon and Nylon

During the April 16-May 15 period, Edward A. O'Neal, Jr., president of Chemstrand Corp., New York, N. Y., predicted that use of nylon tire yarn would sharply increase in the original-equipment passenger-tire field in the next two years.

Currently, this major yarn market is about 98% served by Tyrex, a rayon yarn used in tires of practically all 1959- and 1960-model cars. Since last summer, nylon producers, in what is believed to be an effort to win over car makers to nylon cord, have cut prices twice. Tyrex makers matched both reductions. Mr. O'Neal said that Chem-

CYANAMID CHEMICALS FOR RUBBER

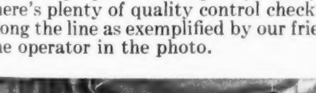
RUBBER Chem Lines

NO. 27 OF A SERIES Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

ZMBT—NEW NAME to Remember in Latex Compounding

ZMBT—four letters which mean nothing phonetically, but they can have an important bearing on the success of your latex compounding. The name, for lack of a better word, describes a rubber accelerator available from American Cyanamid's Rubber Chemicals Department. This short and, we hope, easily remembered trade name, fronts for a long but straightforward chemical name, the zinc salt of 2-mercaptobenzothiazole. Now, we are not here to state that ZMBT is a new product. This chemical type has been around for a long time and has developed quite a reputation, especially among the latex boys. We do contend, however, that ZMBT is just as brimful of quality, uniformity and performance dependability as any other similar chemical type that may be cluttering up your warehouse.

The zinc salt of 2-mercaptobenzothiazole is not as awesome as it sounds. It has 14 carbons, 8 hydrogens, 4 sulfurs, 2 nitrogens and a zinc, neatly arranged in a compact molecule. Looking at it another way, it is two MBT molecules joined by a zinc.



Molecular Weight 397.9

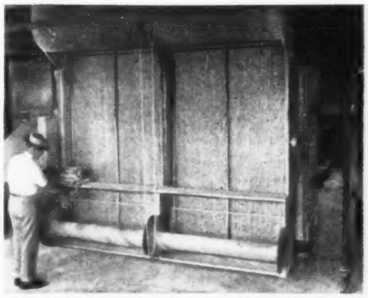
As you might expect, ZMBT isn't quite as simple to make as it looks on paper. The process goes through several steps where extensive "know-how" in rubber chemicals manufacture is essential to provide the proper chemical and physical properties and purity. Oh, yes, there's plenty of quality control checking along the line as exemplified by our friend the operator in the photo.

The net result of all this care and attention is a product which has the following physical properties:

Appearance: Light cream powder
Melting Point: Does not melt below 300°C.
Specific Gravity: 1.72 ± 0.03
Solubility: Insoluble in water and most common organic solvents
Storage Stability: Excellent
Toxicity: Not considered hazardous under ordinary conditions of industrial use

Now, with the preliminaries out of the way, why should you, Mr. Compounder, buy ZMBT? Well, we feel that there is a strong case for Cyanamid here so let's proceed.

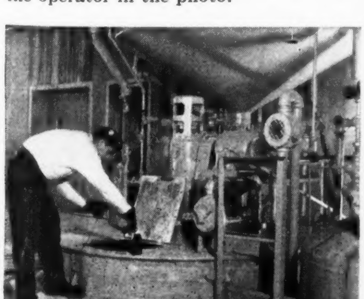
- The know-how to make ZMBT and make it uniform from batch to batch. This has been developed through years of manufacture and thousands of tons of high-quality thiazoles and other rubber chemicals.
- A modern installation equipped with all possible safeguards to provide the maximum in purity and uniformity. That big screen that you see above filters all the air going into the equipment for ZMBT and is typical of the extra care we take with rubber accelerators.
- Added attractions such as a higher bulk density powder and vacuum packaging. The former permits heavier ball mill loads that can be translated into higher production rates whereas the latter gives neat unit loads that require less space in your already overcrowded warehousing facilities.
- The ability to take advantage of truckload and ton prices on mixed truckload shipments of thiazole accelerators, regardless of the poundage of ZMBT in the shipment.
- Strategically located warehousing facilities which assure prompt delivery of quality goods.



All process air used in Cyanamid's Rubber Chemicals manufacture is filtered through this type of automatic air filter.

Look, we have material just itching to be compounded; why don't you take a look at ZMBT for the answer to your requirements. One trial is worth 10,000 words, so they say. Since this chemical finds use in rubber thread, latex foam, latex specialties, both dipped and molded, wire insulation and many automotive accessories, there is a better than even chance that it is a part of one of your present recipes.

We have more information on this ZMBT of ours and samples for evaluation. Just drop us a line here at the home base and we'll oblige. Write to American Cyanamid Company, Rubber Chemicals Department, Bound Brook, New Jersey.



Plant control testing during ZMBT production.

Typical products which can use the zinc salt of ZMBT as part of the rubber recipe.

strand thinks the trend to lower nylon tire yarn prices since 1955 "will continue . . . but at a less sharp rate."

On the other hand, Philip B. Stull, president of American Enka Corp., Enka, N. C., told stockholders at the company's annual meeting that "it now appears that 1961 model automobiles will continue to carry Tyrex cord tires as original equipment." In commenting on the nylon-rayon tire cord struggle, he said that "the battle is now focused on 1962 and beyond, which takes use too far into the future to permit prediction. We can say, however, that the battle is joined, the forces mobilized, and that our cooperative Tyrex promotion program with other members of the industry will be vigorously pressed during the coming years. . . .

"While we continue to back Tyrex in this struggle," Mr. Stull told stockholders, "we will not be left out of this market should the fight be lost to nylon. The first units of our heavy denier nylon facilities should be completed this fall, and these facilities can and will produce nylon tire yarn."

Production of tire cord and fabric (excluding chafer and similar fabrics) amounted to 424 million pounds in 1959, an increase over 1958 and 4% above 1957 output. In 1959, rayon cord and fabric production totaled 297 million pounds (up 20% from 1958), and nylon cord and fabric output was 124 million pounds (up 29%), while cotton cord and fabric at 3 million pounds was off sharply from the 7 million pounds produced in 1958.

In addition to the tire cord and fabric figures noted above, 47 million pounds of chafer and similar tire fabrics were produced last year, against 1958 production of 40 million pounds. Of the 1959 total, 14 million pounds of these fabrics were made of synthetic fibers (up 17% over 1958 figures), and 33 million pounds were made of cotton (up 18%).

Rayon Prices

Tire Fabrics

1100/490/2	$0.625/	$0.78
1650/908/2		.685
2200/980/2		.655

Tire Yarns

High-Tenacity		
1100/ 490, 980	.57/	.66
1100/ 490	.57/	.66
1150/ 490, 980	.59/	.63
1165/ 480	.59/	.66
1230/ 490	.59/	.63
1650/ 720	.50/	.60
1650/ 980	.50/	.58
1875/ 980	.55/	.58
2200/ 960	.49/	.57
2200/ 980	.49/	.57
2200/1466	.49/	.64
4400/2934		.60
Super-High Tenacity		
1650/ 720	.50/	.60
1900/ 720		.58

Nylon Prices

Tire Yarns

840/140	.97
1680/280	.97

CALENDAR

(Continued from page 107)

October 28
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

November 3
Rhode Island Rubber Club. Pawtucket Country Club, Pawtucket, R. I.

November 4
The Philadelphia Rubber Group. Fall Dance. Manufacturer's Country Club, Oreland, Pa.

November 10
Northern California Rubber Group.

November 18
Connecticut Rubber Group.
Chicago Rubber Group.

November 25
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

November 30-December 1-2
U. S. Army Signal Research & Development Laboratory. Ninth Annual Symposium on "Technical Progress in Communication Wires and Cables." Berkeley-Carteret Hotel, Asbury Park, N. J.

December 3
Northern California Rubber Group. Christmas Party.

December 9
Detroit Rubber & Plastics Group, Inc. Christmas Meeting. Statler-Hilton Hotel, Detroit, Mich.

December 10
Southern Ohio Rubber Group. Christmas Party. Miami Valley Golf Club, Dayton, O.

December 16
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Christmas Party. Somerset Hotel, Boston, Mass.

1961

January 20-21
Southern Rubber Group. Statler Hilton Hotel, Dallas, Tex.

January 27
Chicago Rubber Group.

February 7
The Los Angeles Rubber Group, Inc.

March 10
Chicago Rubber Group.

March 17
Boston Rubber Group. Hotel Somerset, Boston, Mass.

March 24
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

STATISTICS of the RUBBER INDUSTRY

U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1959	79,207	93,303	13,127	14,034	120,464	199,671
June	7,445	6,730	1,223	1.196	9,149	16,594
July	5,469	6,871	956	1,279	9,106	14,575
Aug.	7,131	8,225	1,242	1,258	10,725	17,856
Sept.	6,947	8,201	956	1,364	10,521	17,468
Oct.	6,747	9,424	1,020	1,187	11,631	18,378
Nov.	5,055	8,144	1,206	1,104	10,454	15,509
Dec.	6,705	8,429	1,017	1,045	10,491	17,196
1960						
Jan.	5,339	9,720	1,154	1,131	12,005	17,344
Feb.	5,812	9,862	1,085	1,098	12,045	17,857
Mar.*	...	9,351	1,004	1,217	11,572	.....

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1959	555,044	886,275	65,454	84,955	34,638	1,626,366
June	47,786	76,065	5,484	7,083	3,063	139,481
July	47,545	78,995	6,043	6,277	2,419	141,279
Aug.	46,914	75,340	5,533	7,117	3,047	137,951
Sept.	49,252	79,835	6,579	7,326	3,119	146,111
Oct.	49,049	81,963	5,965	7,538	3,128	147,643
Nov.	42,039	69,217	5,327	6,684	2,655	125,922
Dec.	42,950	73,871	5,489	6,996	2,696	132,002
1960						
Jan.	46,354	78,891	6,093	7,361	2,788	141,487
Feb.	46,022	76,999	6,070	7,369	2,765	139,225
Mar.*	47,205	81,065	6,324	7,693	2,645	144,932

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1959	12,377	8,226	1,581	2,883	12,690	25,607
June	11,063	7,314	1,601	2,432	11,347	22,410
July	10,752	6,983	1,528	2,761	11,272	22,024
Aug.	11,472	6,775	1,576	2,779	11,130	22,602
Sept.	11,742	7,196	1,498	2,810	11,504	23,246
Oct.	12,220	7,570	1,464	2,888	11,922	24,142
Nov.	11,707	8,279	1,451	2,975	12,705	24,412
Dec.	12,377	8,226	1,581	2,883	12,690	25,067
1960						
Jan.	12,781	7,781	1,680	2,799	12,260	25,041
Feb.	12,974	8,606	1,534	2,535	12,675	25,649
Mar.*	13,964	8,055	1,518	2,492	12,065	26,029

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1959	303,345	286,410	12,812	27,738
June	26,119	24,998	1,054	23,448
July	27,863	23,942	1,236	25,949
Aug.	25,276	22,914	879	26,165
Sept.	28,123	25,137	937	27,384
Oct.	28,255	26,022	964	27,393
Nov.	22,525	20,217	909	28,526
Dec.	23,720	22,962	1,055	27,738
1960				
Jan.	26,442	26,540	1,106	29,031
Feb.	26,965	25,944	1,258	28,653
Mar.*	29,100	26,625	.....	29,719

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1959	220,336	21,700	39,551	8.256	289,843
Jan.	11,962	1,579	3,430	520	17,491
Feb.	11,615	1,169	2,404	648	15,836
Mar.	16,295	2,238	2,712	467	21,712
Apr.	19,154	2,135	3,741	527	25,557
May	12,281	2,587	2,942	642	18,452
June	21,871	2,386	2,522	937	27,716
July	19,814	1,580	4,105	440	25,939
Aug.	18,054	1,896	2,557	1,025	23,532
Sept.	22,506	2,240	4,864	692	30,302
Oct.	13,476	1,383	2,250	679	17,788
Nov.	18,916	1,242	3,362	648	24,168
Dec.	25,392	1,265	4,662	1,031	32,350
1960					
Jan.	21,967	2,396	4,185	527	29,075
Feb.	22,791	1,528	4,588	740	29,647

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1959					
Jan.	147,243	16,827	15,638	7,335	187,043
Feb.	148,606	16.339	15,990	7,468	188,403
Mar.	146,971	14,441	14,701	7,753	183,866
Apr.	147,867	12,496	14,848	7,728	182,939
May	156,209	12,710	15.024	7,820	191,763
June	145,486	11,128	14,986	7,969	179,569
July	142,606	9,899	15,187	8,912	176,604
Aug.	148,795	10,558	15,745	8,418	183,516
Sept.	147,400	9,535	12,845	8,526	178,306
Oct.	157,768	10,805	13,385	8,649	190,607
Nov.	168,490	11,447	13,043	9,077	202,057
Dec.	174,606	13,188	14,164	8,888	210,846
1960					
Jan.	183,242	14,039	15,143	9,198	221,622
Feb.	186,166	12,735	13,930	8,352	221,183
Mar.*	189,308	12,764	13,491	8,175	223,738

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	Eastern Europe and China	United King-dom	Other Foreign	Total Foreign	Grand* Total
1959	555.0	445.2	180.6	924.2	1,550.0	2,105.0
Jan.	50.0	49.6	15.3	77.2	127.2	192.5
Feb.	47.3	29.8	13.8	77.7	117.5	167.5
Mar.	52.0	19.0	15.3	78.8	117.7	165.0
Apr.	41.5	37.8	13.9	80.2	131.0	172.5
May	38.8	41.2	13.8	76.2	131.2	170.0
June	47.8	42.1	18.3	82.4	134.7	182.5
July	47.5	32.7	13.0	74.3	112.0	172.5
Aug.	46.9	16.8	11.0	67.8	84.6	142.5
Sept.	49.3	41.1	18.1	81.5	122.6	190.0
Oct.	49.0	40.0	15.5	78.5	118.5	185.0
Nov.	42.0	49.4	15.6	78.0	127.4	185.0
Dec.	43.0	48.1	17.0	73.3	136.1	185.0
1960						
Jan.	46.4	...	14.7	...	...	182.5
Feb.	46.0	...	14.3	...	...	...

*Estimated.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; and Secretariat of the International Rubber Study Group.

World Production of Natural Rubber

(1,000 Long Tons)

Year	Malaya Estate	Malaya Native	Indonesia Estate	Indonesia Native	All Other	Total
1959	408.4	289.8	215.6	505.8	645.4	2,065.0
Jan.	37.6	27.2	20.4	22.3	67.5	175.0
Feb.	27.9	21.2	18.3	29.2	38.4	135.0
Mar.	28.5	21.1	17.7	39.4	48.3	155.0
Apr.	28.9	19.4	15.3	44.7	46.7	155.0
May	33.5	22.4	16.3	50.6	49.7	172.5
June	33.9	24.3	18.4	49.5	39.9	165.0
July	35.7	26.9	18.7	35.5	63.2	180.0
Aug.	36.5	24.9	17.9	43.5	54.7	177.5
Sept.	35.7	26.1	17.0	38.8	52.4	170.0
Oct.	36.0	25.5	18.0	53.0	68.5	192.5
Nov.	35.7	24.1	18.0	44.5	62.7	185.0
Dec.	38.6	26.7	19.5	54.7	63.0	202.5
1960						
Jan.	37.4	27.5	18.0	27.7	59.4	170.0
Feb.	32.1	22.6	...	...	...	...

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; Secretariat of the International Rubber Study Group.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdom	Total† Continent of Europe	World† Grand Total
1959	1,071.3	57.2	79.0	231.0	1,567.5
Jan.	89.6	4.4	5.8	15.8	122.5
Feb.	87.4	5.2	5.7	17.5	125.0
Mar.	95.1	5.0	7.0	17.5	132.5
Apr.	79.7	5.1	6.2	18.3	120.0
May	74.6	4.8	6.0	18.3	112.5
June	91.7	5.5	8.1	18.5	135.0
July	93.7	4.5	5.4	19.0	135.0
Aug.	91.0	3.4	4.3	15.5	127.5
Sept.	96.9	5.0	8.3	20.0	142.5
Oct.	98.6	4.8	6.6	20.8	145.0
Nov.	83.9	4.9	7.2	22.3	132.5
Dec.	89.1	4.7	8.7	21.7	137.5
1960					
Jan.	95.1	4.8	8.4	..	140.0
Feb.	93.2	...	8.5	...	...

*Includes latices.
† Figures estimated or partly estimated.
Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch United States Department of Commerce.

World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany	Total
1959	1,379.7	100.7	48.1	1,528.5
Jan.	108.5	13.0	2.0	123.5
Feb.	102.3	11.7	2.3	116.3
Mar.	111.4	7.5	3.7	122.6
Apr.	108.5	0.0	3.5	111.9
May	110.0	0.3	3.0	113.3
June	106.7	0.4	4.7	111.5
July	114.3	9.2	3.2	126.7
Aug.	119.0	11.1	4.7	134.8
Sept.	119.8	11.4	4.6	135.9
Oct.	128.5	11.5	5.1	145.1
Nov.	124.8	11.9	5.4	142.1
Dec.	125.8	13.0	5.9	144.7
1960				
Jan.	106.9	12.6	5.9	125.4
Feb.	104.6	...	...	...

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1959	580,197	1,130,660	81,008	124,815	43,169	1,959,849
Jan.	54,950	90,261	4,992	9,991	3,260	163,454
Feb.	48,917	83,067	5,650	10,256	3,324	151,214
Mar.	48,584	91,847	6,056	9,690	3,784	159,961
Apr.	44,347	88,444	6,279	10,455	3,299	152,824
May	45,451	89,625	6,467	10,249	3,610	155,402
June	46,048	87,221	5,583	10,216	3,696	153,124
July	47,527	94,749	6,391	9,365	3,811	161,843
Aug.	45,359	97,113	8,050	10,471	3,397	164,930
Sept.	47,643	97,677	7,399	10,888	3,883	167,490
Oct.	48,378	106,643	7,957	10,099	3,833	176,910
Nov.	48,844	101,856	7,523	11,660	3,786	173,669
Dec.	54,149	102,157	8,661	11,475	3,486	179,928
1960						
Jan.	40,134	106,853	8,171	11,958	3,760	170,876
Feb.	46,761	104,603	6,514	12,106	3,111	173,095
Mar.*	....	109,440	7,605	11,305	3,583	....

*Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1959	71,745	80,646	11,394	13,258	105,298	177,043
Jan.	7,184	6,886	925	1,244	9,055	16,239
Feb.	6,489	7,083	859	1,009	8,951	15,440
Mar.	7,052	7,275	1,054	1,208	9,537	16,589
Apr.	5,793	5,629	1,104	1,169	7,902	13,695
May	5,429	5,962	995	1,112	8,069	14,966
June	5,622	6,497	910	1,150	8,557	14,179
July	5,004	5,804	919	940	7,663	12,667
Aug.	6,613	7,348	961	1,116	9,425	16,038
Sept.	6,342	6,919	910	1,178	9,007	15,349
Oct.	6,153	7,388	969	1,158	9,515	15,668
Nov.	4,858	6,427	893	981	8,301	13,159
Dec.	5,206	7,428	895	993	9,316	14,522
1960						
Jan.	5,493	8,094	999	1,117	10,210	15,701
Feb.	5,463	7,838	969	1,000	9,807	15,270
Mar.*	4,847	8,104	1,076	927	10,107	14,954

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

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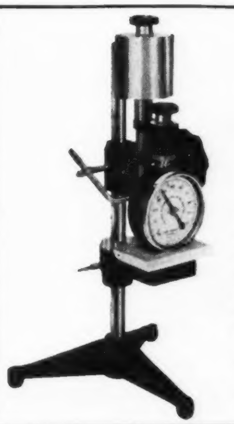

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Carbon Black Statistics—First Quarter, 1960

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; GPF, general-purpose furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

	Jan.	Feb.	Mar.
Production			
Furnace types			
Thermal	14,746	12,438	14,690
SRF	27,138	25,673	28,063
HMF	6,645	5,919	5,777
GPF	9,462	9,722	9,833
FEF	21,450	22,599	23,423
HAF	49,793	43,816	44,466
SAF	—	1,549	1,778
ISAF	24,744	25,283	30,116
Total furnace	153,978	146,999	158,146
Contact types	25,590	23,503	25,099
Totals	179,568	170,502	183,245
Shipments			
Furnace types			
Thermal	19,372	9,159	14,100
SRF	25,327	25,680	29,378
HMF	5,533	6,780	6,759
GPF	8,194	9,034	9,556
FEF	20,845	20,824	22,421
HAF	45,492	42,592	44,037
SAF	826	993	1,483
ISAF	23,034	27,284	28,253
Total furnace	148,623	142,346	155,987
Contact types	40,807	15,474	23,666
Totals	189,430	157,820	179,653
Producers' Stocks, End of Period			
Furnace types			
Thermal	16,097	19,376	19,966
SRF	24,506	24,543	23,228
HMF	4,894	4,033	3,051
GPF	6,253	6,941	7,218
FEF	10,957	12,732	13,734
HAF	35,630	36,854	37,283
SAF	3,254	3,810	4,105
ISAF	30,364	28,363	30,226
Total furnace	131,955	136,652	138,811
Contact types	52,025	60,054	61,487
Totals	183,980	196,706	200.298
Exports			
Furnace types			
Total furnace	37,598	26,574	—
Contact types	23,310	10,635	—
Totals	60,908	37,209	—

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

U.S.A. Rubber Industry Economic Indicators

	Production Index*				% Return †	
	Total Rubber and Seasonally Adjusted, %		Plastics Products Without Seasonal Adjustment, %		On Sales	On Investment
	1947-49	1957	1947-49	1957	R&MP‡	R&MP
Year	100	100	100	100		
1959	199	114	199	114	4.0	8.6
Jan.	189	108	198	113		
Feb.	197	113	208	119		
Mar.	196	112	206	118	3.9	8.0
Apr.	182	104	187	107		
May	183	105	179	103		
June	205	117	199	114	4.4	10.4
July	223	128	187	107		
Aug.	210	120	203	117		
Sept.	209	120	212	121	4.1	8.8
Oct.	201	115	211	121		
Nov.	198	113	203	116		
Dec.	203	116	194	111	3.7	8.8
1960						
Jan.	205	117	215	123		
Feb.	. .	. .	212	121		

* F.R.B. Index of Industrial Production revised to include plastics products and change base period.
† Base Data F.I.C.-S.E.C.-Quarterly Financial Reports—% Calculated by RMA.
‡ R&MP = Rubber and Miscellaneous Plastics, a classification revised according to the 1959 Standard Industrial Classifications.

U.S.A. Production of Cotton, Rayon, and Nylon Tire Fabrics

(Thousands of Pounds)

	Cotton and Nylon*			
1958	Cotton Chafer Fabrics and Other Tire Fabrics	Cotton and Nylon Tire Cord and Fabrics	Rayon Tire Cord and Tire Cord Fabric	Total All Tire Cord and Fabrics
Jan.-Mar.	9,750	18,820	66,830	167,924
Apr.-June	7,890	24,725	49,454	80,533
July-Sept.	7,999	24,904	†	91,984
Oct.-Dec.	10,533	26,392	71,827	107,532
1959				
Jan.-Mar.	9,163	32,402	77,307	122,290
Apr.-June	7,699	29,403	76,265	116,965
July-Sept.	8,318	31,545	76,671	119,748
Oct.-Dec.	7,279	34,179	66,756	111,332
1960				
Jan.-Mar.	8,055	37,638	68,699	116,595

* Cotton and nylon figures combined to avoid disclosing data for individual companies.
† Not available.
Source: Bureau of the Census, United States Department of Commerce.

U.S.A. Rubber Industry Sales and Inventories

(Millions of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1957	1958	1959	1960	1957	1958	1959	1960
Jan.	496	448	508	530	1,047	1,100	1,013	1,148
Feb.	495	413	490	540	1,036	1,087	1,032	1,140
Mar.	476	412	506	. . .	1,030	1,112	1,030	. . .
Apr.	490	429	543	. . .	1,031	1,047	1,015	. . .
May	481	428	524	. . .	1,024	1,020	995	. . .
June	458	445	520	. . .	1,027	986	1,013	. . .
July	514	478	519	. . .	1,045	980	1,075	. . .
Aug.	481	438	492	. . .	1,074	1,024	1,113	. . .
Sept.	481	464	544	. . .	1,074	1,024	1,114	. . .
Oct.	490	493	555	. . .	1,097	1,022	1,115	. . .
Nov.	431	472	482	. . .	1,101	1,018	1,120	. . .
Dec.	427	518	508	. . .	1,092	994	1,124	. . .
Total	5,720	5,438	6,191	. . .	12,678	12,414	12,759	. . .

* Adjusted for seasonal variation.
Source: Office of Business Economics, United States Department of Commerce.

U.S.A. Rubber Use by Products

(1,000 Long Tons)

	Transportation			Non-Transportation			
Year	Natural	Synthetic	Total	Natural	Synthetic	Total	Grand Total
1952	303.2	539.4	842.6	150.6	267.7	418.3	1,260.9
1953	358.2	500.3	858.5	195.3	284.7	479.8	1,338.3
1954	386.3	391.0	777.3	210.0	245.8	455.7	1,233.0
1955	409.6	550.3	959.9	225.2	344.7	569.8	1,529.7
1956	364.0	533.0	897.0	198.1	341.3	539.5	1,436.5
1957	342.7	583.5	926.2	196.0	342.4	538.5	1,464.6
1958	302.0	558.9	860.9	182.4	321.0	503.5	1,364.4
1959	354.7	669.6	1,024.3	200.4	401.7	602.1	1,626.4
1959							
1st qt.	95.1	172.3	267.4	54.1	99.8	153.9	421.4
2nd qt.	78.7	148.5	226.3	49.1	98.6	147.8	374.1
3rd qt.	94.0	182.7	276.7	49.7	98.8	148.6	425.3
4th qt.	86.7	167.2	253.8	47.4	104.4	151.7	405.6

Source: Secretariat of the International Rubber Study Group.

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U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumer's Price Index
		All Rubber Products			
1939	121.0	$27.84	39.9	$0.75	
1959					
Jan.	199.1	100.28	41.1	2.44	123.8
Feb.	198.8	101.09	41.6	2.43	123.7
Mar.	201.5	103.74	42.0	2.47	123.7
Apr.	176.0	101.57	41.8	2.43	123.9
May	171.8	101.46	42.1	2.41	124.0
June	196.1	98.74	40.3	2.45	124.5
July	203.4	107.10	42.5	2.52	124.9
Aug.	203.8	105.33	42.3	2.49	124.8
Sept.	212.4	102.01	41.3	2.47	125.2
Oct.	212.3	101.18	40.8	2.48	125.5
Nov.	209.4	97.66	39.7	2.46	125.6
Dec.	208.0	101.59	40.8	2.49	125.5
1960					
Jan.	207.8	102.16	40.7	2.51	125.4
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1959					
Jan.	76.9	117.55	41.1	2.86	
Feb.	76.2	118.98	41.6	2.86	
Mar.	77.9	122.96	42.4	2.90	
Apr.	66.0	123.98	42.9	2.89	
May	52.2	126.13	42.9	2.94	
June	70.7	108.93	36.8	2.96	
July	79.7	128.74	43.2	2.98	
Aug.	78.4	127.74	43.3	2.95	
Sept.	80.5	117.56	40.4	2.91	
Oct.	79.7	117.49	40.1	2.93	
Nov.	78.7	112.62	38.7	2.91	
Dec.	78.1	118.59	40.2	2.95	
1960					
Jan.	78.3	121.10	40.5	2.99	
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1959					
Jan.	17.1	78.20	39.9	1.96	
Feb.	17.1	80.59	40.7	1.98	
Mar.	17.4	79.79	40.3	1.98	
Apr.	12.9	73.05	39.7	1.84	
May	17.7	79.58	40.6	1.96	
June	18.2	81.58	41.2	1.98	
July	18.3	78.60	40.1	1.96	
Aug.	18.4	79.17	40.6	1.95	
Sept.	19.0	79.18	40.4	1.96	
Oct.	19.1	79.40	39.9	1.99	
Nov.	19.7	79.80	39.9	2.00	
Dec.	19.4	80.79	39.8	2.03	
1960					
Jan.	18.8	78.99	39.3	2.01	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1959					
Jan.	105.1	91.27	41.3	2.21	
Feb.	105.5	91.96	41.8	2.20	
Mar.	106.2	93.02	41.9	2.22	
Apr.	97.1	90.03	41.3	2.18	
May	101.9	92.18	41.9	2.20	
June	107.2	94.98	42.4	2.24	
July	105.4	95.40	42.4	2.25	
Aug.	107.0	93.21	41.8	2.23	
Sept.	112.9	94.73	42.1	2.25	
Oct.	113.5	93.38	41.5	2.25	
Nov.	110.5	89.87	40.3	2.23	
Dec.	110.5	92.93	41.3	2.25	
1960					
Jan.	110.7	92.89	41.1	2.26	

Source: BLS, United States Department of Labor.

U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
Passenger Car						
1959						
Feb.	2,442	4,932	60.2	7,434	8,962	19,435
Mar.	2,930	6,261	61.7	9,253	9,959	20,181
Apr.	3,115	6,390	64.8	9,569	6,986	17,597
May	2,848	5,617	38.4	8,504	6,953	15,721
June	2,904	5,936	46.3	8,886	9,022	16,134
July	3,188	5,988	65.4	9,242	9,857	16,853
Aug.	973	5,721	67.3	6,761	8,458	18,677
Sept.	1,923	5,850	77.4	7,850	8,804	19,636
Oct.	2,628	6,015	78.9	8,722	9,374	20,287
Nov.	1,252	4,161	63.5	5,476	7,088	21,996
Dec.	2,916	3,829	105.8	6,849	8,349	23,599
1960						
Jan.	3,912	6,006	111	10,030	9,011	22,567
Feb.	3,569	5,257	78	8,804	9,371	22,972
Mar.	3,333	5,156	90	8,578	9,679	24,144
Truck and Bus						
1959						
Feb.	364	679	74	1,117	1,308	3,584
Mar.	406	842	56	1,304	1,391	3,680
Apr.	479	907	44	1,430	1,039	3,276
May	442	738	41	1,222	943	3,006
June	488	820	44	1,352	1,272	2,954
July	400	844	47	1,290	1,366	3,023
Aug.	276	874	46	1,196	1,225	3,054
Sept.	422	969	58	1,448	1,299	2,906
Oct.	338	1,151	57	1,546	1,510	2,864
Nov.	189	737	56	981	1,259	3,137
Dec.	285	739	75	1,099	1,301	3,355
1960						
Jan.	421	826	45	1,292	1,315	3,376
Feb.	428	789	59	1,275	1,401	3,502
Mar.	421	671	67	1,158	1,436	3,777
Total Automotive						
1959						
Feb.	2,805	5,611	135	8,551	10,270	23,019
Mar.	3,336	7,103	117	10,557	11,350	23,862
Apr.	3,594	7,297	108	10,999	8,025	20,872
May	3,291	6,356	79	9,726	7,796	18,727
June	3,392	6,756	90	10,237	10,294	19,098
July	3,588	6,832	112	10,532	11,223	19,877
Aug.	1,249	6,595	114	7,957	9,683	21,730
Sept.	2,345	6,819	135	9,298	10,103	22,542
Oct.	2,966	7,166	136	10,269	10,884	23,151
Nov.	1,440	4,898	120	6,458	8,347	25,133
Dec.	3,200	4,567	181	7,948	9,649	26,955
1960						
Jan.	4,333	6,833	156	11,322	10,325	25,943
Feb.	3,996	6,047	136	10,179	10,772	26,473
Mar.	3,753	5,827	157	9,737	11,115	27,921

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Automotive Inner Tubes

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
1959						
Feb.	311	3,924	81	4,316	4,094	7,364
Mar.	339	4,013	83	4,435	4,459	7,629
Apr.	389	3,473	65	3,928	3,380	7,218
May	363	2,853	59	3,275	2,752	6,849
June	392	3,421	59	3,872	3,683	6,999
July	317	3,564	66	3,948	4,345	7,560
Aug.	210	3,297	77	3,583	3,716	7,848
Sept.	347	3,258	88	3,693	4,065	8,334
Oct.	265	3,571	79	3,915	4,392	9,088
Nov.	163	2,867	67	3,097	3,756	9,918
Dec.	240	2,793	102	3,135	3,612	10,536
1960						
Jan.	365	4,964	62	5,391	3,899	8,924
Feb.	370	3,553	87	4,011	4,043	9,002
Mar.	365	2,807	111	3,282	4,241	10,113

Source: The Rubber Manufacturers Association, Inc.

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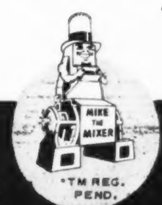

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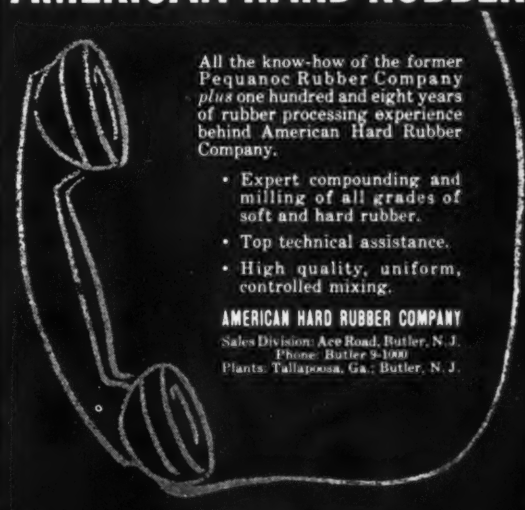

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